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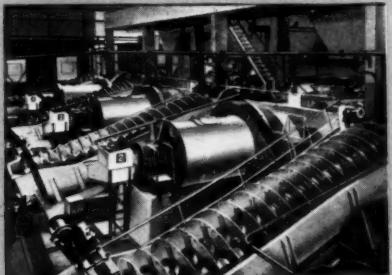
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# The Mining Journal

LONDON, JANUARY 16, 1959

Vol. 252. No. 6439.

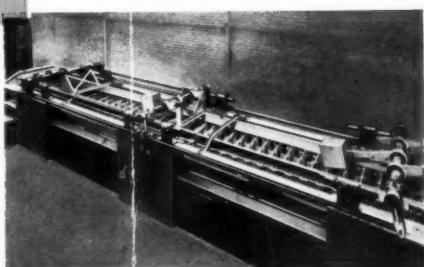
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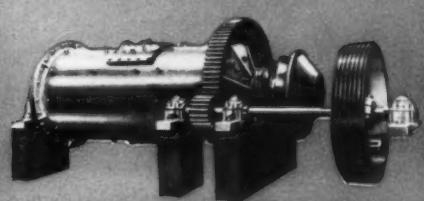
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# The Mining Journal

London, January 16, 1959

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## Extraction of Minerals by Atomic Blasting

FOLLOWING the successful results of the atomic explosions in Nevada, the feasibility of using nuclear explosives for breaking up ore- or oil-bearing formations has been attracting increasing attention in the United States. As reported in our issue of November 21, 1958, the A.E.C. has established a programme known as "Plowshare" for the peaceful utilization of nuclear explosions. Included in this programme is project "Gnome", a proposed experiment to generate power and recover radioisotopes by detonating an atomic device 1,200 ft. underground in salt formations near Carlsbad, New Mexico.

Now comes the news that for the first time the U.S. Government has formally offered to sanction the use of atomic explosives for purely commercial purposes. This proposition was put forward during a government-sponsored conference on nuclear explosions and oil shale utilization, at which the A.E.C. expressed its willingness to experiment with nuclear blasting for the economic extraction of petroleum from rock shale.

The proposal is that the government would spend roughly \$1,000,000 to detonate an atomic device in the mountains of Colorado, provided that the oil industry would share with the A.E.C. and the Bureau of Mines the additional costs—estimated at about \$1,200,000—of setting up the experiment and analysing the results. If the test proved successful, it could lead to large-scale exploitation of vast oil shale beds extending through Utah, Colorado and Wyoming, which hitherto have remained a negligible source of oil on account of the high production costs.

More than a dozen large oil companies have extensive properties in this area. By existing methods of mining and heating oil shales, they are able to extract a thick, waxy liquid known as kerogen, for which a limited market has been developed locally for fuel. So far, however, no economic method has been evolved for turning kerogen into petrol and other useful products.

According to a Bureau of Mines' report circulated at the conference, the present costs of producing shale oil, which has to be refined further for industrial use, break down as follows: 50 per cent for digging, blasting and removing the shale from the mountains; 15 per cent for preparing the shale for extracting the oil; and 35 per cent for the actual operation of oil extraction. The U.S. Government proposes to pulverize a thousand tons of shale in the mountain by a single atomic blast. An attempt would then be made to ignite the combustible shale fragments on the spot, thus providing the heat to extract the oil. Because of the difference in the combustion temperatures of shale and shale oil, only the shale would burn. As the oil settled to the bottom of the cavity, it would be piped out as either a gas or a liquid. According to a Bureau of Mines' report, this technique would reduce mining costs, cut down the expense of shale preparation, and eliminate the use of extraction equipment.

The Bureau of Mines estimates that some 300,000 tons of shale might be freed by a single 10-kiloton explosion at one possible site which has been selected in the north-west corner of Colorado. The investigators have calculated that after the explosion the shale

should have an average of between 15 and 25 gals. of oil a ton depending on its location in relation to the blast. It is evident, however, that in an experiment which—literally as well as figuratively—will be breaking entirely new ground—the results of the explosion can only be roughly assessed. In attempting to compute the probable cost reduction, little or no guidance can be afforded by the A.E.C.'s underground blasts for military purposes in Nevada, since these were in softer and more porous rock. Moreover, an A.E.C. physicist told the conference that the cost of detonating the nuclear blast could be considerably reduced if the device were stripped of its present military trappings. He further stated that increasing the explosive size of the bomb did not increase the costs of the bomb itself; hence the larger the explosion, the more economical it might prove to be.

Some executives in the oil industry doubt whether even the savings which might be effected by the adoption of nuclear methods would be sufficient to make the production of oil from Colorado shale an immediate success. The consensus of opinion, however, appears to be that the experiment is worth making.

Assuming that the oil companies are willing to put up the necessary \$600,000, it is improbable that the actual test will be held before 1960 at the earliest, since the U.S. has a self-imposed ban on all atomic tests until October 31. In fact, the possibility cannot be excluded that the Atomic Weapons Conference now in progress at Geneva might decide to ban all future atomic tests, peaceful or otherwise. However, from the U.S. Government's active interest in the underground application of explosives, it seems reasonable to infer that the Administration sees no insuperable difficulty in achieving an international ban on nuclear tests for military purposes without prohibiting the development of atomic devices for peaceful uses.

In view of the rising trend of mining costs, which is likely to be accelerated in coming years by exhaustion of the richer and more accessible deposits, there can be no question as to the wisdom of spending the immense sums necessary to explore the potentialities of a technique which might lead to the more economic extraction of minerals. If the proposed Colorado experiment materializes and the results are sufficiently encouraging, it is possible that the scope for underground application of atomic explosives in the mining industry might prove to be considerably wider than can be foreseen at the present time.

### THE PRIME CONTRACTOR ABROAD

The prime contractor and his services to British mining were discussed in a recent article (*The Mining Journal*, January 2, 1959, pages 9 and 10), in which it was suggested that his emergence in the export field might provide at least a partial solution to several related problems. The article pointed out that the prime contractors who in recent years had been acting in that capacity at home tended to be firms which were themselves interested in the manufacture of one or more of the principal items of mine equipment. Primarily, the services required have been those of preparing schedules of equipment and work for tender, assigning contracts, and supervising the quality and timing of the subcontractors' plant and machinery deliveries, as well as of the final on-site erection.

The view was expressed in the article that, outside those areas of the world where large British mining houses were active, the prime contractor, working in conjunction with a mining consultant, might be in a position to offer the owner of a new property experienced and integrated services which could greatly accelerate the early development of the mine without straining the possibly limited resources of

technical staff, and without encumbering the new mine with a large planning and purchasing staff which eventually would not be required.

It was further pointed out that no country would be likely to appoint a British prime contractor unless it was prepared to buy British, and that, once this initial step had been taken, it was very much easier both for the owner of the mine and for the various manufacturers in Britain to deal with a prime contractor with whose methods of operation they were familiar.

There could be no more striking example of the scope for the prime contractor in overseas markets than the mill at St. Patrick's Mines, Avoca, in Eire, a description of which will be found on pages 61-65. Claimed to be the most modern plant of its kind in Europe, this 4,000 t.p.d. mill was designed by a prime contractor working in association with a mining consultant and assigning contracts to a considerable number of sub-contractors.

From statements made at the opening ceremony last year, it was evident that this system of operation had proved advantageous from the owner's point of view. From our own national standpoint, a particularly gratifying feature of the mill is that practically every item was manufactured in the United Kingdom—an achievement which is impressive testimony to the comprehensive range of machinery and equipment for ore treatment which British industry is in a position to supply. There could, in fact, be no finer shop window for the manufacturers concerned.

A point which will not have escaped attention is that the prime contractors for the mill at Avoca were in effect acting as salesmen for some twenty or thirty other British firms. This has obviously been of particular benefit to companies with little experience of export selling. From this aspect alone, it is evident that there is a valuable role for the prime contractor in the export field.

### AUSTRALIA'S UNSATISFACTORY TIN POSITION

The position of tin mining in Australia is unsatisfactory. Expansion of industry, particularly the young tinplate industry, forecasts a consumption of some 4,500 tons of metal in the very near future; at present the country requires about 2,500 tons per year, but annual production approximates 1,700 tons. The difference must be imported. Potential tinfields are now few, and the search for tin should be made more popular to investors and speculators.

One means of encouragement would be tax relief, by placing the industry on the same basis as gold, with taxation exemption, or at least until such time as capital and exploratory costs have been reimbursed to shareholders. Representations have been made to the Commonwealth Government for the payment of a bounty on tin produced, or the imposition of tariff restrictions, to give an Australian price on a guaranteed level to Australian producers. The government, however, does not consider that any special assistance for the protection of the industry is needed.

Logically, help for the industry should be directed in the first place to assistance in the search for new deposits and their development. This could be by way of taxation remission or direct financial aid such as is given to the search for oil. The objective, to place the country in a position to supply its rapidly growing needs, is sufficiently important to warrant the cost involved, otherwise the alternative is heavy importation. Little relief can be expected from discovery of new alluvial deposits, but attention must be given to abandoned lode tin areas previously more or less productive in a small way, and intensive exploration of likely stanniferous country.

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At the present time Australia relies largely on two dredging companies in North Queensland: Tableland Tin, producing 60 to 70 tons of tin oxide per month; and Ravenhoe Tin, with an output of about half that tonnage. This output is supplemented by the small Dorset Flat dredge in Tasmania. The big lode tin producer in that State, Aberfoyle Tin, is within a few years of the end of its operations. The company has recently become interested in the neighbouring Storey's Creek mine, with an important lode, but wolfram is heavily predominant over tin, and the successful sale of that mineral will be an important factor in tin production.

The most interesting move in the tin-mining branch of the mining industry is the link-up between Mount Lyell Mining and Railway Co., and Renison Associated Tin Mines, on the West Coast of Tasmania. The latter company holds extensive low-grade pyritic tin deposits, and the controlling interest and finance of Mount Lyell will ensure intensive development, with the possibility of establishing a large lode tin-mining enterprise. Australia's largest tin producer is Tableland Tin, which in the year to June 30, 1958, dredged 3,219,898 cu. yds. and recovered 629 tons of tin oxide of 71.31 per cent grade. Working costs were 20.268d. cu. yd.

### EXPANDING DEVELOPMENT OF LEAD

The lead industry is backing up its earlier announcement of greatly expanded research and market development efforts with approved appropriations for 1959 almost double those of 1958, according to a recent statement made by Robert L. Ziegfeld, secretary-treasurer of the Lead Industries Association in New York. Actual expenditures for research on lead will be more than four times what they were this year, and will be administered by Dr. Schrade F. Radtke, recently appointed research director for both the lead and zinc industries. At the same time, the budget for lead market development and technical service other than research will be increased by approximately 50 per cent. Thus the total funds to be spent through the Association alone in 1959 will be close to \$750,000.

Thirteen research projects and fellowships are already in progress, with three more ready to start. At least a dozen other projects are under investigation. The work is being placed in universities, private research organizations, and co-operatively with private companies, not only in the United States, but in some instances abroad. It is being financed by an international group of companies producing lead in the United States, Canada, Mexico, South America, Australia, and Africa.

Areas being subjected to research investigation are widely varied, and include such divergent fields as organolead compounds, alloys, ceramics, emissivity, and continuous extrusion, to name only a few.

The market development programme will make available to industry the results of research as they develop in a form to be most readily useful.

### SUNNY DAYS FOR COPPER

A home with a copper roof that collects heat from the sun in winter and rejects it in summer was described at a recent conference in New York co-sponsored by the Copper and Brass Association. This new fuel-less house is being tested at Tucson by the Institute of Atmospheric Physics, University of Arizona. The experimental heating and cooling system uses a total of 4,600 lb. of copper—2,000 lb. for the solar collector roof, 2,000 lb. for the interior ceiling panels, and about 600 lb. for piping. It

could be used in homes costing \$16,000 (say, £5,700) and upwards.

According to Mr. Raymond W. Bliss, jun., associate physicist and director of the solar house project, the key to the system is a highly conductive copper solar collector, which also functions as the pitched roof of this single-storey house. A large insulated tank outside the house (which in an actual residential installation would be buried underground) stores water which acts as the energy transport and storage medium. Interior heating and cooling are accomplished through the use of copper ceiling panels similar to those used for the roof.

Water from the storage tank is pumped through integral copper tubes in the roof collector. This water is heated to high temperatures by passing through the tubes on the roof, and is then returned to the tank. A second pump automatically moves the heated water in the tank through similar copper tubes in the ceiling panels, thus providing radiant heat in the interior of the house. During protracted cloudy weather, or when the outside air temperature falls below a given point, the supplementary heat pump system goes into action to heat the top portion of the tank. For summer cooling, the copper roof collector is used to reject heat from the system each night by radiation and convection to the atmosphere, the cooled water being returned to the storage tank.

Although the solar house is not economically feasible at the present time, it might well become so in five years. Potentially, therefore, it appears to be one of the largest single applications for copper.

### PHILIPPINE NICKEL DEVELOPMENT

New measures designed to encourage foreign investment in the development of nickel and iron deposits in the southern Philippines are reported to be under study. A government committee recently discussed details of a public bidding to be called shortly on the development project of the nickel reservations in Surigao Province in north-eastern Mindanao Island. This public bidding, the second to be held on the project, will carry conditions stipulated under an amended Nickel Law passed during the last Congress. There were no bidders during the first public bidding, mainly due to the fact that terms laid out in the original Nickel Law were considered to be too unfavourable for foreign investors.

As amended last June, the Nickel Law allows foreign capital invested in the development project to retain 65 per cent of the net gain, or 6.5 per cent of the gross income whichever might be lower. The original law provided for foreign capital to retain only 50 per cent of the net gain, or 5 per cent of the gross income whichever might be lower. The Philippine Government would get the balance.

Other amended measures include:

(a) Permission to repatriate abroad 80 per cent of the dollar investments during the first five years of operation. Under the original law, the amount of dollars that could be sent out was to be subject to negotiation with the government;

(b) Foreign technical staff employed on the project would be exempted from government examinations.

(c) A successful bidder would be given an option to extend the operation agreement beyond the first 50 years for the development of the same area or of new areas which might be opened by the government. The operating agreement to be executed would be for 25 years, renewable for another 25 years. This preferential treatment was not extended in the old law.

The government committee is also studying the possibility of tapping local capital for investment in the project.

# Uranium Mining in Canada and the U.S.

**W**HILST uranium mining has its own particular hazards, the mining methods used are those conventionally applied in other branches of the mining industry. Canadian and American contributions to the Geneva Conference on uranium mining are of particular interest for the cost data included more than for their detailed descriptions of methods, which are dealt with only briefly here.

## Canadian Mining

Canada's uranium mines and their production are listed below:

Area	Mine	Nominal mill capacity (tons per day)
Great Bear	Eldorado's Port Radium	300
Marion River	Rayrock	150
Beaverlodge	Eldorado's Beaverlodge	2,000
	Gunnar	1,800
	Lorado	750
Blind River (Elliot Lake)	Pronto	1,500
	Algoma Quirke	3,000
	Algoma Nordic	3,000
	Consolidated Denison	6,000
	Can-Met	3,000
	Northspan (Lake Nordic)	4,000
	Northspan (Panel)	3,000
	Northspan (Spanish American)	2,000
	Stanrock	3,000
	Stanleigh	2,000
	Milliken	3,000
Bancroft	Bicroft	1,200
	Faraday	1,400
	Dyno	1,100
TOTAL milling capacity (tons per day)		42,200

The mining methods used are open-pit and conventional underground mining using track haulage, and trackless mining using electric or diesel-driven vehicles. Open-pit mining is limited to the Gunnar mine, where it is now giving way to underground mining. The open pit at surface is 1,000 ft. long by 800 ft. wide. The rim of the open pit is within 100 ft. of the adjacent lake. The rock is mined in 30 ft. benches, leaving a 21 ft. berm. The waste-to-ore ratio for the entire pit is 2.4 to 1.

At Blind River, the conglomerate beds range from a minimum mining width of 6 ft. up to 32 ft. or more. Faulting is prevalent throughout the district, the ore horizons being displaced from a few feet to 100 ft. Dips vary between 8 deg. at Stanleigh to 32 deg. at Algoma Quirke. Where dips are less than 20 deg., trackless mining methods have been generally adopted. Track mining methods are practised at Pronto and Algoma Quirke and Stanleigh. The ore is stoped, using panel and room and pillar methods.

The Bicroft and Faraday mines working pegmatitic deposits north-east of Toronto use conventional mining methods modified to suit local conditions. Bicroft uses a shrinkage system throughout its orebody, but at Faraday

flat-lying ore-shoots are open-stopped, leaving rock pillars, and in particularly irregular shoots cut and fill stoping has been adopted with fill obtained from deslimed mill tailings. Rock-bolting is used extensively to support the hanging wall of the orebodies.

Operating costs in Canadian uranium mines are of the following order:

	Costs per ton of ore delivered to the mill
Low-cost mining, such as open pit	\$2.50
Normal mining costs, including development	\$4 - \$6
High-cost operations: mining and development with small production from narrow, rich veins	\$10 - \$15

The Bicroft and Faraday mines have disclosed provisional operating costs based on a short period of working.

	Bicroft	Faraday
Development	\$2.28	2.64
Mining	3.92	4.52
Milling	3.68	3.12
General Expense	0.97	(included above)
Per ton milled	\$10.85	\$10.28

## United States Producers

In the United States recent discoveries of large shallow deposits have given an increased importance to open-cut mining methods. During January of this year, 451 American mines produced 352,619 tons of uranium ore. Sixty of these were open-cut mines, which accounted for 160,285 tons, over 45 per cent of total ore output.

The cost of producing a ton of ore from United States open-pit mines ranges from \$4.80 to \$11.80, much of the excavation being carried out by contractors.

At the Midnite mine, Washington, five open pits are being opened up on a contract basis. The contract calls for the excavation of 400,000 tons of ore and 1,100,000 tons of waste at a daily production rate of 1,000 tons of ore. The pits are cut into a hillside and 20 ft. benches with 9 ft. berms are developed. The largest of the five pits is 750 ft. long, 250 ft. wide, and averages 80 ft. in depth. Truck-mounted drills are used, and 25 tons of ore broken per foot drilled and 10.2 tons per lb. of explosive used.

At the Poison Canyon mine, New Mexico, 22 ft. of overburden is stripped at an average cost of \$0.45 per cu. yd. The orebody is 8 ft. thick, and 125 tons of ore are mined per day at an overall cost of \$3.25 per ton.

The Jackpile open-cut in New Mexico is the largest United States uranium producer. The deposit now being worked was first located by airborne radiometric reconnaissance in November, 1951, and production began in March, 1954.

At the Rattlesnake mine in Utah, an experimental open pit has been developed with 50 ft. benches and 30 ft. berms.

Stripping of overburden was carried out under contract at \$0.3 per cu. yd., and a pit floor 300 ft. by 450 ft. was eventually established at a depth of 170 to 300 ft. Published costs and operational data are tabulated below:

RATTLESNAKE MINE, UTAH—MINING OPERATION DATA

Tons waste to tons ore removed during mining	2 : 1
Average daily tonnage, ore and waste	600
Pound explosive per ton	0.55
Tons moved per man-shift (twelve men)	50
Tons broken per foot of hole drilled	1.5
<i>Costs per ton of Ore Shipped</i>	
Amortization, depreciation, etc.	\$ 2.50
Development stripping	12.00
Mining, ore sales, overhead, etc.	3.50
<b>TOTAL</b>	<b>\$18.00</b>

Unit Costs—Ore and Waste Removed

Direct Mining:	\$
Drilling	0.070
Labour (\$0.03), bits (\$0.002), steel (\$0.030), compressed air and miscellaneous (\$0.008).	
Blasting	0.175
Labour, primary (\$0.015), explosives (\$0.120), secondary blasting and loading at stockpile (\$0.040).	
Pit loading and hauling	0.225
Labour (shovel, \$0.050; trucks, \$0.175).	
<b>TOTAL direct mining</b>	<b>\$0.470</b>
Indirect Mining:	\$
Camp, roadwork (\$0.080), labour (\$0.040), supplies (\$0.080), miscellaneous (\$0.130)	0.330
<b>TOTAL indirect mining</b>	<b>\$0.330</b>

The pit is 3,600 ft. long, 1,600 ft. wide, and each day 3,000 tons of ore and 36,000 cu. yds. of waste are excavated. By January of this year, ore production totalled 1,981,365 tons and 33,211,098 tons of waste had been removed. Selective mining is practised, costs comparing favourably with other open-pit uranium producers. Three tons of ore are broken per lb. of explosive used, and from 64 to 120 tons per foot drilled.

About 10 per cent of United States uranium reserves occur as disseminated ore in the Tertiary sediments of Wyoming. Core drilling is unsuited to these friable sediments and air-swept rotary drilling is used, penetrating as much as 1,000 ft. in an eight-hour shift. Costs range from \$0.50 to \$1 per foot. In wet rock, rotary drilling is impossible, but diamond core drilling is feasible, using diesel fuel cooled by dry ice to 0 deg. F. as a circulating fluid. Core recovery of 98 per cent is possible, with costs ranging from \$2 to \$10 per foot.

#### Underground Mining

The high-grade lenses and pods of carnotite ores occurring in the sandstone formations of the Colorado plateau have been exploited in the Salt Wash mines since the early 1900s. The lenses average 3 ft. in thickness, and the mines developed on them are mostly small and are principally served by adits and inclined shafts up to 200 ft. deep. Where the orebodies lie deeper, two compartment cribbed shafts up to 600 ft. deep have been sunk.

In most Salt Wash mines the ore is extracted by open stoping, with random waste pillars for roof support. Mechanization is limited. Small 40-50 lb. rock drills mounted on airlegs are used exclusively, either with tungsten carbide insert chisel bits or socket-fit hard-surfaced four-wing one-use bits.

In a few mines five tons of waste must be broken for each ton of ore excavated. The workhorse of the Salt Wash mine is the slusher, 5 to 10 h.p. double-drum electric or air driven hoists being commonly used. The average direct mining cost is \$9.75 a ton and varies from \$6.75 to \$14.50 a ton.

The tabular gently dipping orebodies of the Big Indian district, Utah, gave United States uranium operators their first opportunity to plan integrated mining and development systems. The thickness and continuity of the orebodies, which are 3 to 55 ft. thick and contain up to 80,000 tons of ore, permitted extensive mechanization. The use of the Gismo in uranium mining was pioneered at the Big Buck mine, where overall mining costs averaged \$5.88 a ton during 1956-57. Production per man-shift for all underground labour reaches 26 tons in some of these mines.

An interesting feature of the mines at Temple Mountain, Utah, is that many of the shallow deposits of this area, which range in depth from 100 to 250 ft., are reached through 36 in. calyx drill holes. These shafts, the deepest of which is 20 ft., were drilled in 1952 under contract, using truck-mounted calyx drills at \$35 a foot. Present-day costs are \$40 to \$45 per foot. The overall drilling rate through sandstone and mudstone was 8 ft. per eight-hour shift.

At the La Sal mine in the Big Indian district, a 36 in. dia. ventilation shaft was drilled 518 ft. with a truck-mounted churn drill. The hole was first drilled at 22 in. dia. and then enlarged to 36 in., using a 3½ ton reaming bit. The contract price in 1955, including the installation of steel shaft lining, was \$44.90 per foot. A year later, two 400 ft. shafts were churn drilled at the Grants mine in New Mexico at a cost of \$43.50 per foot.

#### AVERAGE MINING COSTS IN \$/TON OF ORE MINED IN U.S. URANIUM MINES

		\$	(1)	(2)	(3)	(4)	(5)
1. Development costs/ton			3.08	—	—	0.88	0.87
2. Mining:							
Labour and supervision		7.06	1.25	1.98	3.93	4.05	
Explosives		0.75	0.66	0.65	0.62	0.63	
Drill steel and bits		0.27	0.27	0.20	0.18	0.16	
Other direct costs		1.64	2.08	0.96	1.60	1.38	
Indirect costs		2.13	1.62	2.29	2.29	1.34	
3. TOTAL		14.93	5.88	6.08	9.50	8.43	
4. Production per man-shift overall (tons)		2.1	10.4	13.3	5.7	4.1	
5. Explosives (lb./ton)		3.5	2.4	2.4	2.5	2.8	

(1) Average for ten Salt Wash mines in Colorado.

(2) Big Buck mine, Utah.

(3) 1957 average for six mines in the Big Indian district, Utah (south end of field).

(4) 1957 average for six mines in the Big Indian district, Utah (north end of field).

(5) Average 1955-57 for two mines at Temple Mountains, Utah.

## Victoria Assists Mineral Exploration

THE Victorian Government will now assist mining companies in the search for new ore by grants for diamond drilling on approved projects on a pound-for-pound basis.

Victoria is definitely a gold province, with deposits concentrated in an area of 5,000 sq. miles, which in the past has been remarkably rich, and in which concealed orebodies can be expected to occur. The assistance to be given is an important forward step. Already, Gold Mines of Australia has been active on the old Stawell Goldfield, and the company's work has indicated that a new and important field may be developed. The same company is also drilling the old Clunes field in central Victoria.

## AUTOMATIC WINDER CONTROL—II.

## A Further System of Mine Winder Control

**I**N Germany, the first pit to change over to automatic winding was the Hugo shaft of Wintershall A.G., at Lehrte. This shaft has a four-deck cage winder which is frequently, but not always, used to transport rubble on its downward journeys. The overloads experienced during decking, therefore, vary considerably. Automatic winding has been in operation since early in 1957, and despite the continually varying load conditions the levelling accuracy is maintained to within 1 to 2 cm. Compared with manual control, as formerly employed, output has been increased by 10 per cent.

At the Emil Mayrlich mine of the Eschweiler Bergwerksverein in Germany, a four rope tower-mounted winder with six-deck cages capable of raising a load of 25.2 tons has been operating with automatic control since May, 1957. From oscillograms recording manual, regulated manual, and automatic control, respectively, the following values have been obtained for average decking time ( $t_{Um}$ ), the

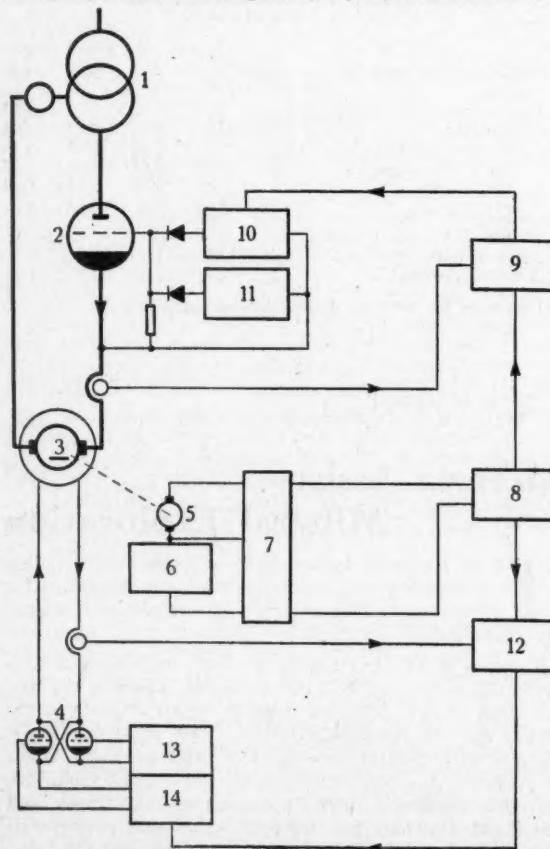
average ( $v_{Bav}$ ) and maximum ( $v_{Bmax}$ ) speeds of the cage when the brake is applied.

Control	Regulated		Automatic
	Manual	Manual	
$t_{Um}$ ...	5.2 s.	4.6 s.	3.69 s.
$v_{Bav}$ ...	0.86 m./s.	0.67 m./s.	0.43 m./s.
$v_{Bmax}$ ...	1.1 m./s.	1.0 m./s.	0.6 m./s.

Because, with automatic control, the brakes are applied more rapidly but less viciously due to the initial pressure, decking is carried out more rapidly and accurately with less jerking. Here, too, a levelling accuracy of 1 to 2 cm. is maintained and gradual stopping enables the tubs to be pushed into or out of the cage at once, thus reducing time lost.

A further installation of this kind has more recently been converted to automatic operation at the Germania pit of the Dortmunder Bergbau A.G., Dortmund, Germany. This is a ground-mounted winder with five-deck cages, capable of raising 15 tons at a speed of 16 m./s.

Schematic circuit diagram of the Contiflux system for controlling mutator-fed winders: 1, Mutator transformer; 2, Armature-current mutator; 3, Winder motor; 4, Field-current mutators; 5, Tacho-generator; 6, Reference potentiometer; 7, Reference-value converter; 8, Pre-amplifier; 9, Armature-current regulator; 10, Grid control set; 11, Changeover contactor; 12, Field-current regulator; 13, 14, Grid control sets



### The Contiflux Principle

For mutator-fed winders, the same control and supervisory elements, i.e. electric retardation in relation to the load, continuous speed regulation, etc., are used, but the control gear operates on the Contiflux principle. Only one mutator is used for the armature, while two cross-connected rectifiers feed the field. In contrast to converter-fed drives, the armature current with this system always flows in the same direction, while the field current is reversible, both armature and field currents being continuously controlled.

The first mutator-fed winder with fully automatic control was installed by Brown Boveri at the Friedrich Heinrich I pit at Kamp-Lintfort, Germany. This installation is regarded as noteworthy because it includes the latest refinements in winder design: tower-mounted skip winders with four-rope suspension, mutator feed, and automatic control of the two winders, and a special arrangement for the automatic filling and emptying of the skips. It is claimed that the use of mutators in conjunction with automatic control, and, for the first time in Germany, roller guides on steel tracks, has enabled this installation to achieve an unequalled efficiency.

By JOHN GRINDROD

Not only had the skips, in this case, to be brought into the end position rapidly and accurately, but care had also to be taken that the skips did not strike the closing gear at too high a speed. In addition, the skips had to stop just before the discharging point and were not allowed to proceed under automatic control to the final position until sufficient space was available for discharging the skip's load. The skip winder depth is 600 to 750 m., service load 17.6 tons, and winding speed 8 to 16 m./s. The mechanical equipment for this installation was supplied by Gutehoffnungshütte Sterkrade A.G.

# Western Europe's Most Modern Flotation Mill

**T**HE concentrator at Avoca, Co. Wicklow, is believed to be the largest flotation mill in Western Europe, and is certainly the most modern. It was designed by A. Wansbrough Jones and Son, consulting engineers, in association with P. R. Rose, A.M.I.Struct.E., for Denver Equipment Co. Ltd., to treat 4,000 t.p.d. of copper/pyrite ore. Denver Equipment Co. Ltd. were also responsible for the supply of all equipment, including pipework, electrical installation, and lighting, all of which was manufactured in the United Kingdom.

The property is owned and operated by St. Patrick's Copper Mines Ltd., the shares of which are controlled by Irish Copper Ltd., of Canada, a subsidiary of Mogul Mines Ltd. Proved reserves at Avoca exceed 20,000,000 tons, averaging 1.1 per cent copper and 11 per cent combined sulphur, from which 160 t.p.d. of copper concentrates will be produced, averaging about 22 per cent Cu, equivalent to a 90 per cent recovery of copper. Production of pyrite concentrates will be 450 t.p.d. at 48 per cent sulphur, giving a 60 per cent recovery of sulphur.

Mr. S. Lemass, Minister of Industry and Commerce in the Republic Government of Eire, performed the official opening ceremony on October 15, which was attended by many well-known personalities from the Canadian mining world and members of the Canadian Government.

A good deal of effort has gone into making this opening ceremony possible, and no description of the mill would be adequate without tribute to the sustained contribution made by the personnel of St. Patrick's Copper Mines Ltd., under their managing director, Mr. H. D. Forman, by whom the actual construction of the mill foundations was undertaken. The structure was supplied by Messrs. Thomas Thompson, of Carlow, and was erected by the Dublin Erection Co., which was under contract to the former company. Some portion of the background history of this project has appeared in other issues of this journal, but one of the initial steps in bringing it into being was the considerable testwork programme undertaken, over a period of some nine months, to determine the breakpoint and consequent mesh of grind of this rather complex orebody, from which the richest mineral had been taken many years earlier by other prospectors. A certain amount of test-work was done in Canada, but it was the work carried out under Dr. S. A. Wrobel, A.R.S.M., for Denver Equipment Co. Ltd., and the flowsheet drawn by Denver Equipment Co. Ltd., upon which the design of the whole mill and the specifications of the

equipment were based. The crushing section is rated at approximately 400 t.p.h. and includes the following equipment:

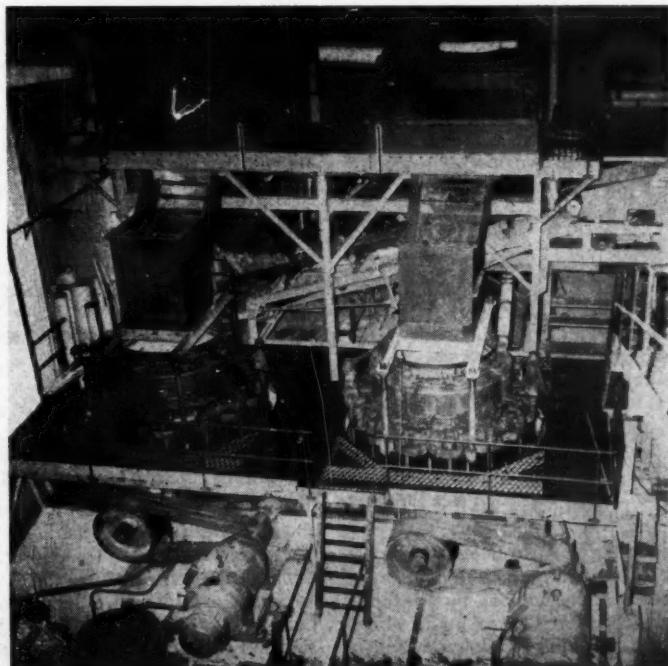
A 30 in. Nordberg primary gyratory crusher weighing 70 tons, one  $5\frac{1}{2}$  ft. standard Symons cone crusher of 42 tons, and two  $5\frac{1}{2}$  ft. short-head Symons cone crushers with a combined weight of 84 tons. There are also two 6 ft. x 10 ft. Nordberg rod deck screens.

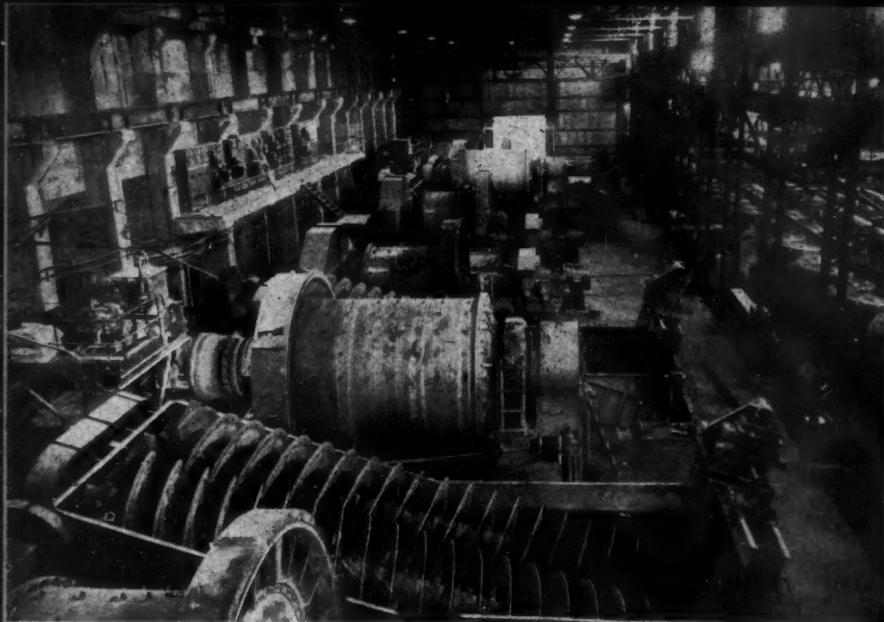
## Crushing Circuit

Run-of-mine ore at the coarse ore bin is fed by gravity into the 30 in. gyratory crusher through a Ross patent chain feeder, size 8W (special). A feature of this installation is that in the space available it was only possible to fit a size 7W machine, which did not seem quite adequate for the required duty. However, a recent development in head-drum design had successfully just undergone trials on a small machine; by using this design, it proved possible to accommodate No. 8 chain in a No. 7 frame, with a gain in total chain weight from 18,000 to 24,000. This is the largest Ross patent chain feeder in Europe.

After being reduced in the primary crusher to  $-5$  in., the ore is discharged on to a conveyor system which may perhaps best be followed by reference to the flowsheet on page 63. No. 1 feed conveyor has been designed as an entirely removable unit to facilitate maintenance of the crusher and, in common with all conveyors in this section, operates at 300 f.p.m. No. 2 and No. 4 conveyors travel respectively under 56 in. and 46 in. Boxmag electro-magnets. No. 2 conveyor discharges into a concrete surge hopper from which the material is fed by a Model F 55 Syntron feeder, designed to handle 400 t.p.h. with the trough at 10 deg. to the horizontal, to the standard Symons cone crusher. Now reduced to  $0\frac{1}{2}$  in., the material discharges direct from the crusher to No. 3 conveyor, which is equipped with three heavy-duty impact idlers at the point of discharge of the crusher and installed in a pit below it. Via conveyors No. 4 and 5, the feed discharges two ways through a distribution box to two more Model F 55 Syntron feeders, each capable

A view of the crushing section, showing standard and short-head crushers





The grinding bay

ELEV  
PLAN

of handling 400 t.p.h. with troughs at 10 deg. to the horizontal. These Syntron feeders discharge in turn to the two rod deck screens, from which point the oversize is returned for further crushing and the undersize continues by conveyors No. 6, 7 and 8 to No. 9. No. 9 conveyor has a total length of 260 ft. 8 in., 80 ft. 6 in. of which is inclined and the remaining 180 ft. 2 in. horizontal, along the length of the 6,000-ton capacity reinforced concrete storage hopper. With a walkway on each side, this conveyor is equipped with a two-way throw-off carriage into the fine ore bin.

All belts for these conveyors were vulcanized on site into endless lengths.

The nine conveyors described, with six more in the grinding section, were supplied by Phoenix Supply Co. (Croydon) Ltd., and designed in association with Niagara Screens (Great Britain) Ltd.

The three Model F 55 Syntron feeders, supplied by Riley (IC) Products Ltd., have troughs 36 in. wide by 72 in. long and all are sling mounted. Each feeder is provided with a controller incorporating a half-wave rectifier and a variable rheostat through which the rate of flow can be adjusted from minimum to maximum rate of feed.

The two suspension magnets supplied by Electromagnets Ltd. have oil-immersed rectifier/transformer equipment, and are equipped with that company's special control gear embodying non-induction resistance units. With geared, hand-operated trolleys, they can be drawn to one side of the conveyors for discharging the tramp iron.

#### Grinding Section

Four flat belt conveyors, Nos. 10, 11, 12 and 13, each 24 in. wide and in line under the whole length of the fine ore bin, receive material from vibrating tray feeders on to belts fitted with continuous skirt plates. Nos. 10 and 11 run towards each other to discharge on to No. 14, while Nos. 12 and 13 discharge similarly on to No. 15. Both 14 and 15 are inclined troughed belt conveyors installed at 20 deg. to the horizontal with adequate weighing equipment fitted over 10 ft. of their length, and each discharges into a rod mill.

This wet grinding circuit incorporates two Pegson-Marcy rod mills, each 9 ft. dia. by 12 ft. long, and four 9 ft. by 9 ft. Pegson-Marcy ball mills. Manufactured by Pegson Ltd. at their Coalville works, these mills are all of the open-end discharge type, the rod mills with drum-type

feeders and the ball mills with combined drum and double scoop type feeders. For ease of maintenance these ball mills, working in closed circuit with classifiers, can be operated in two independent sections, each comprising one rod mill and two ball mills, and capable of treating 2,000 t.p.d.

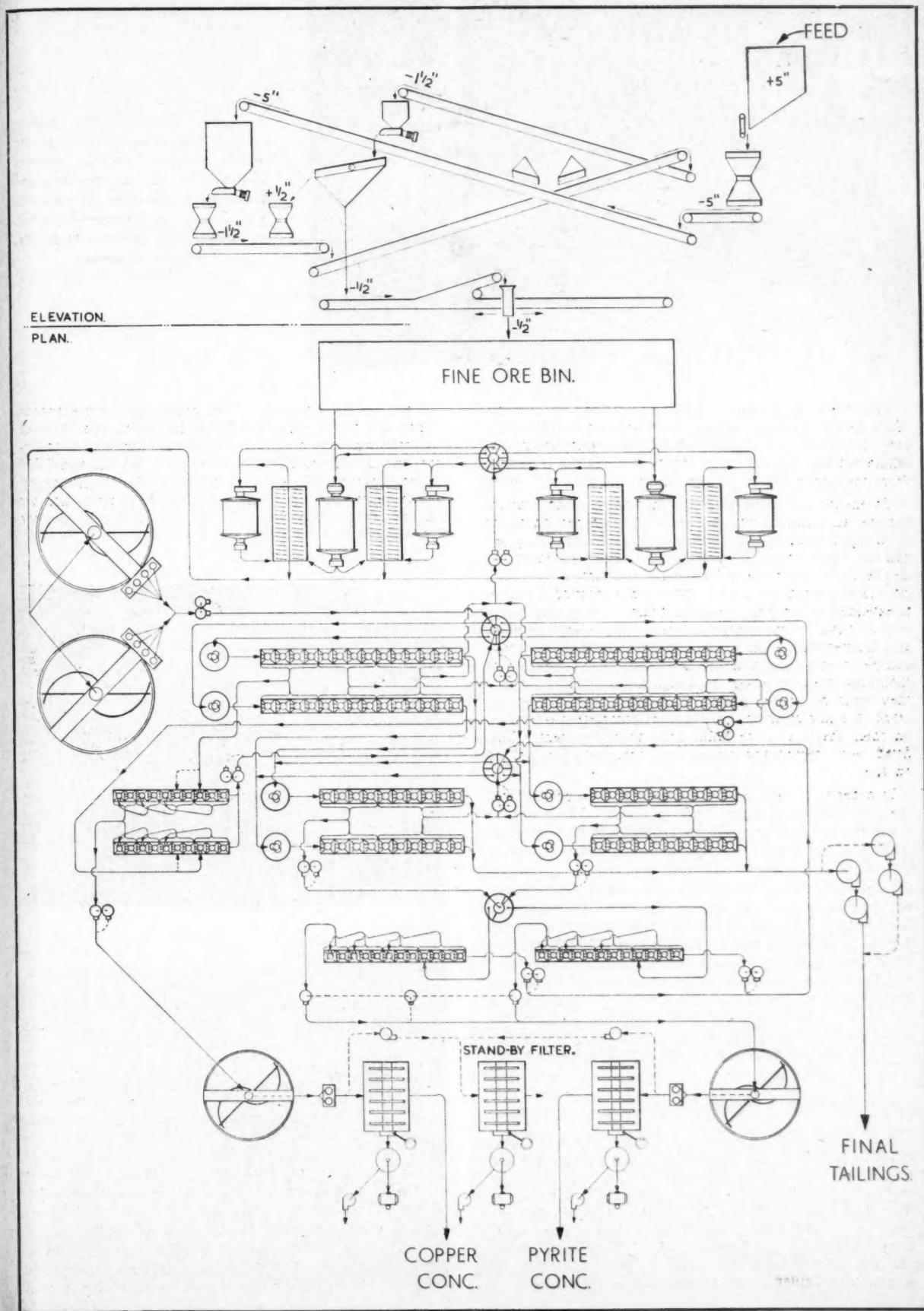
The  $\frac{1}{4}$  in. material is fed to the rod mill drum feeder, from which it discharges through a spiral feed trunnion to the mill proper. The rod charge of approximately 50 tons reduces the feed to  $\frac{1}{4}$  in. in size, expelling it to a splitter, which divides the discharge equally to the classifiers. Oversize from the classifiers is picked up by the ball mill double scoop feeders and is delivered to the mill proper through a spiral trunnion. Here the ball charge of some 32 tons reduces the material to -20 mesh, returning it to the classifiers; the oversize being recirculated to the ball mills for regrinding.

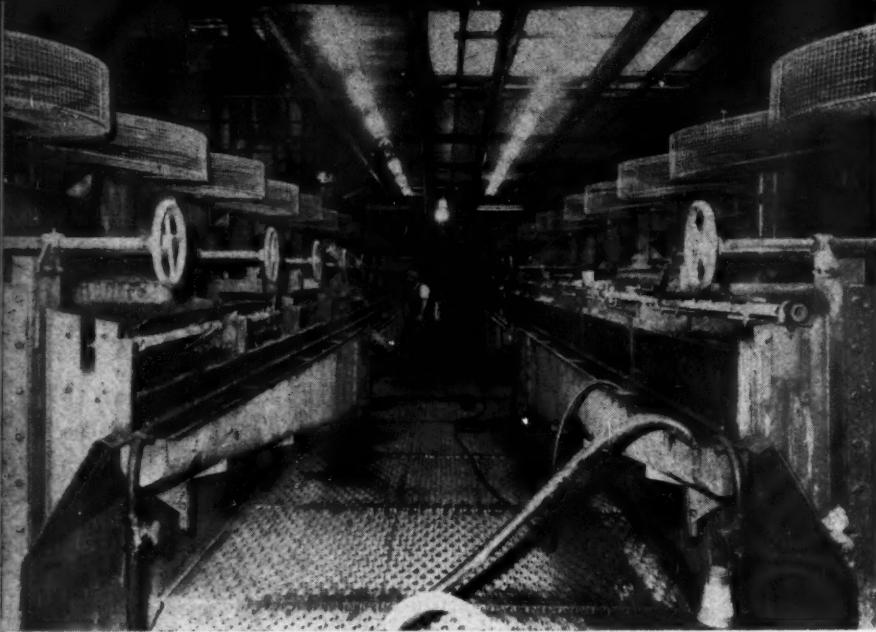
The four Akins classifiers manufactured by Head Wrightson Stockton Forge Ltd., a subsidiary of Head Wrightson and Co. Ltd., are of the submerged spiral type with 72 in. dia. duplex double-pitch spirals. Each machine is designed to overflow 1,000 short tons per day at 100 mesh Tyler. With a spiral speed of 2 r.p.m., each classifier is capable of handling a circulating load of approximately 3 to 1.

Each classifier tank is 33 ft. 6 in. long by 12 ft. 9 in. wide, and the lower end is provided with weir boards, so that the overflow can be varied between a maximum height of 99 in. and a minimum of 84 in. At maximum weir height, the tank has a pool area of 345 sq. ft. when set at a slope of  $3\frac{1}{4}$  in. per foot.

Each spiral consists of a 16 in. dia. heavy steel pipe shaft to which are bolted welded steel arms carrying the double pitch spiral flights. The latter are fitted with renewable H.C.I. wearing shoes. Each spiral shaft is fitted at the upper end with the C.S. bevel sheet, and the wheels for the two spirals are driven from a common shaft, the latter being driven through a set of spur gears and Texropes from a 20 h.p. motor. This arrangement gives maximum flexibility if for any reason it is found necessary to step up the raking capacity of the classifier.

It is interesting to note that on the spiral remote from the mill a paddle has been fitted at the sand discharge end. This paddle pushes the sand, raked by the outer spiral, towards the centre of the tank, so that it is not necessary to carry the sand return launder to the outside of the classifier tank. This saves height in the launder fall and consequently reduces the radius of the mill scoop.





Two of the four 14-cell No. 30 Denver Sub-A flotation machines in the copper roughing section, showing four type M units in the right-hand bank. Below, in centre of page, the 9 ft. x 6 ft. dia. Denver disc filter. At bottom right, the two 70 ft. dia. Denver thickeners

Denver thickeners

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The lower end of each pipe shaft revolves upon a specially designed spindle bearing, with opposed Timken bearing, and fitted with a series of Giteals which make the whole bearing water and grit proof. This bearing is greased from the upper end of the pipe shaft.

To ensure easy starting after a shut-down without draining the tank, and to facilitate servicing or inspection of the submerged bearing, the lower end of each pair of spirals can be lifted from the pool by a rope-operated lifting device. This comprises a 5 h.p. motor, Texrope drive, and double worm reduction gear. The output shaft of the latter is extended to carry the two rope drums. The lifting device is controlled by momentary contact "stop-start" buttons, and is fitted with a small solenoid brake so that the spirals can be lifted and held in any desired position. Because of their size, it was necessary to design these classifiers so that they could be broken down for shipment, but to keep site work to a minimum the spirals were completely assembled on their shafts and the tanks split down the centre line, fitted with temporary stays, and arranged for bolting on site.

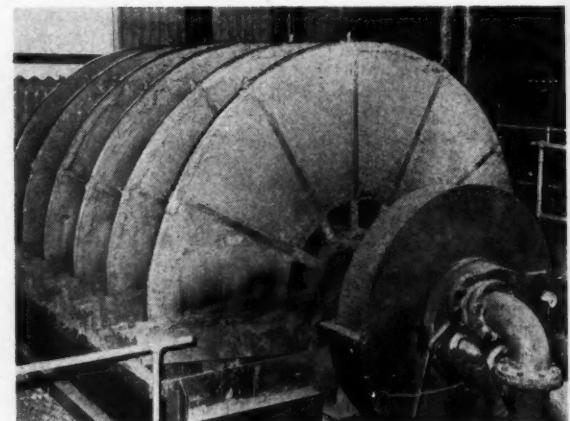
In order to allow liberation of the copper sulphides from the pyrite, grinding is held to 80 per cent -200 mesh, the classifiers overflowing at 20 per cent solids. Lime for pH control of the copper circuit is added at the rod mills at the rate of 2 lb./ton, the pH being held at 10.5.

John Smith (Keighley) Ltd. manufactured the two electric overhead travelling cranes, one of which, a 25-ton four-motor unit with an auxiliary hoist motion to lift 5 tons, is erected in the crushing section. With a span of 44 ft. centres, the crane rails are 49 ft. above floor level, and the 25-ton load is lifted on eight falls of  $\frac{1}{2}$  in. dia. steel wire rope. The second crane, installed in the grinding section, is a 15-ton three-motor unit spanning 57 ft. centres, with the crane rails 24 ft. above floor level. Both cranes are cage-operated by crank handle reversing controllers.

#### Copper and Pyrite Flotation Section

The classifier overflows are thickened to 40 per cent solids in two 70 ft. dia. Denver spiral rake thickeners and pumped to a four-way distributor. The pulp flows by gravity to four 10 ft. dia. Denver agitators and thence to four banks of 14-cell No. 30 Denver "Sub-A" flotation machines. The rougher concentrate is cleaned three times in two 10-cell No. 24 Denver "Sub-A" flotation machines and the tailings from the copper rougher units flow by gravity to a similar circuit for flotation of the pyrite.

Reagents for flotation of the copper and simultaneous depression of the pyrite are added at the four-way Denver self-rotating pulp distributor. Dithiophosphate, a collector, and dowfroth, at the rates of 0.15 lb./ton and 0.015 lb./ton respectively, are used for flotation of the copper. Pyrite depressants are cyanide and zinc sulphate, which are added at the rates of 0.05 lb./ton and 0.25 lb./ton respectively.



To recover the pyrite, copper sulphate is used as an activator at the rate of 0.15 lb./ton and the pyrite floated with amyl xanthate and dowfroth at 0.25 lb./ton and 0.010 lb./ton respectively.

The final copper concentrate is pumped to a 34 ft. dia. Denver concentrate thicker and filtered. The filter cake, at approximately 8 to 10 per cent moisture, discharges by gravity to the floor of the loading bay below. The clean pyrite concentrate is handled in the same way. There are three 9 ft. dia. by 6-disc Denver disc filters, one for use as a standby for either product. Feed to both copper and pyrite filters is controlled by Denver adjustable stroke diaphragm pumps, the discharge from these pumps being diverted to a Denver SRL pump and thence to the standby filter when necessary.

Three Nash Hytor vacuum pumps were supplied for the Denver filters. These are size H-9 units, each with a capacity of 1,150 c.f.m. air at 23 in. Hg. operating vacuum and driven at 370 r.p.m. through V-belts by an 80 h.p. motor.

Three size No. 1 Nash Hytor clean air compressors are installed to blow the cake from the filter discs. Each compressor has a capacity of 120 c.f.m. free air at 2 p.s.i.g., the drive being at 1,250 r.p.m. through V-belts by a 7½ h.p. motor. Of water ring design, these vacuum pumps and compressors were manufactured by the Norman Engineering Co. (Great Britain) Ltd.

Two 10 in. by 8 in. Denver SRL pumps, operating in series, deliver the final tailings to a site four miles from the mill. The tailings line of 12 in. dia. asbestos cement pipe handles the pulp at 25 per cent solids at a velocity of 6.4 ft. per second.

### Electrical Installation

Complete electrification of the mill was carried out by Crompton Parkinson Ltd., the electrical installation, including the extensive cable work, being undertaken by Holliday, Hall and Stinson Ltd., under the supervision of Crompton Parkinson's contract department.

A power supply of approximately 3.5 mVA. was provided at 38 kV. by the Eire Electricity Supply Board, who erected an outdoor high-tension substation complete with transformers, the secondary connections terminating in an 18-panel C.P. Klad and cubicle switchboard. The main switchboard, comprising three incoming cubicles, two bus sections, and thirteen Klad A oil-immersed circuit breakers rated at 1,200 and 600 amp., provides switching facilities for the twenty-five multi-motor starter Allen West switchboards. These in turn control all the C.P. motors in the various sections of the mill.

The gyratory and three cone crushers are equipped with 200 h.p. totally enclosed slipring motors, and the rod and ball mills with 525 h.p. motors. To permit power factor correction, these 525 h.p. units are open-type autosynchronous, operating at 0.9 leading power factor on a 3.3 kV. supply.

The bulk of the motors supplied are in the flotation section and are all of the totally enclosed squirrel-cage type suitable for shaft-up operation. In the copper section alone, there is a total of fifty-six No. 30 flotation cells on roughing and twenty No. 24 cells on cleaning the concentrates; being arranged for dual drive, these flotation cells are equipped with twenty-eight 25 h.p. and ten 15 h.p. motors respectively. In addition, the pyrite section has a total of forty No. 30 flotation cells on roughing and twenty-four No. 24 cells cleaning, and these are mounted with twenty 25 h.p. and twelve 15 h.p. motors. Including ancil-

lary equipment, ninety-six motors totalling 1,689 h.p. were supplied for this area alone. These, with other motors required for pumps, thickeners, screens, filters, reagent feeders, and tailings disposal pumps, make a total of 233 motors supplied from the Crompton Parkinson works at Chelmsford and Guisley, amounting to 7,670 installed h.p. in all.

Good lighting is important in most industrial operations, but in none more than in the flotation process. This has been ensured by the use of 140 Crompton fluorescent, vitreous enamel finished AX 11V fittings, giving a local intensity over the cells of 15 ft. candles from daylight tubes. Three hundred and fifty tungsten fittings of various types are installed throughout the remainder of the plant, bringing the total lighting load to approximately 100 kW.

### Pipework Installation and Dust Extraction Plant

J. T. Meredith Ltd., with their associated companies, were employed for the pipework installation, involving connections throughout the plant and the use of pipes varying from the ½ in. dia. compressed-air line to the 16 in. dia. launder from the ball mills. Materials and tools were supplied from this country, with some additional small items from Irish suppliers.

The same company was responsible for the design, manufacture, and installation of the dust-extraction plant in the crushing section, where collecting hoods formed at the head and tail of conveyors in this area remove the dust generated as the material passes from one conveyor to another. Suction points are divided into five zones, each forming a separate unit complete with high-velocity centrifugal fan and air washer in which air is saturated with water to remove the dust.

A point of special interest is that supervising engineers only were sent from London for the installation of this not inconsiderable section of the contract, and the bulk of the work was carried out by largely unskilled local labour recruited into an efficient and willing team by the resident engineer representing the company on site.

### Loading and Despatch

From the bay under the filter section, the concentrates are loaded by Chaseside loaders to C.I.E. dump trucks and hauled seven miles to the storage shed at Arklow Harbour, where the pyrite concentrates are dried in a 6 ft. by 30 ft. rotary drum oil-fed dryer.

Conveyor loading is used from the storage shed to the ship's hold, and a rate of 250 t.p.h. can be maintained.

Speaking at the opening celebrations, Mr. C. P. McTague, Canadian chairman of St. Patrick's Copper Mines Ltd., referred to the possibility that at some future date a smelter might be erected at Arklow to process concentrates from Avoca. This would lead to the production of sulphuric acid and thus provide the basis for a new fertilizer industry in Eire. It seems doubtful whether the output from St. Patrick's alone would justify the construction of a smelter, but presumably such a venture would be economically more worth while if concentrates became available from other sources in Eire, such as Allihies. Whilst this remains for the time being in the realm of conjecture, the concentrator at Avoca stands as yet another memorial to what may be achieved when men of purpose co-operate together to wrest riches from the sources available to them.



## Machinery and Equipment

### New Flameproof Coal Drill

The frictional sparking hazard with light alloys on drilling machines is claimed by Victor Products (Wallsend) Ltd. to have been eliminated with the introduction of the company's flameproof coal drill, designed specifically to eliminate the hazards associated with conventional drill case materials.

The British Safety in Mines Research Establishment has demonstrated the occurrence of frictional sparking on materials such as magnesium and aluminium conventionally used for portable tools, when these materials are brought into violent sliding contact with a rusty steel surface. The resultant spark can ignite a flammable gas with possibly disastrous results. No such ignitions have been obtained with ferrous materials.

The new drill has all external parts, including the fan, made from ferrous material, containing no aluminium, magnesium, etc., liable to cause an ignition or explosion from a frictional spark, i.e. all external parts are in materials whose specification is approved for coal face use.

Use of 150-cycle high-frequency supply, in conjunction with a compact epicyclic gearbox, has permitted the fitting of a larger motor without decrease in the power/weight ratio. The overall weight is 33 lb., some 10 lb. less than standard 50-cycle aluminium coal drill.

An improved five-pin bolted cable gland is fitted and the pilot circuit incorporates a germanium rectifier and a sealed on-off switch for operation under the arduous conditions of coal drilling. The drill does not require any exemption or permit for the use of light alloys at the coal face, and is fully covered by Buxton flameproof certificates. It is the latest addition to the range of Victor coal and stone rotary drills.

#### INEXPENSIVE CONVEYING AND SCREENING

A portable conveyor with vibrating screen to give inexpensive conveying of bulk materials where simple screening

Alongside, at right, the new flameproof coal drill by Victor Products (Wallsend) Ltd. Below, the Loadascreen at work in a Leicestershire quarry



into two or three sizes is also needed has just been announced by Frederick Parker Ltd.

The prototype of this new machine, the Loadascreen, has been successfully tested in a Leicestershire quarry, and is now being marketed with a 40 ft. boom and 18 in. belt. A range of eight sizes is planned.

The Loadascreen now being produced consists of a boom of box-type construction mounted on pneumatic-tyred wheels for towing and easy handling. The projected larger sizes will be of lattice-type construction. The conveying belt, with head and tail pulley, is mounted on the boom and supported by all-steel ball-bearing idlers.

At the discharge head of the conveyor, a single or double deck vibrating screen separates the material into two or three sizes. Deflection plates are fitted so that the screened material can be loaded into lorries or stockpiled. Slewing wheels are available as an aid to stockpiling.

The boom angle can be adjusted by wire winch or—in the case of the larger machines which will join the range soon—by hydraulic ram. Petrol, diesel, or electric motor is available as a power unit. The starters are operated from ground level. The diesel unit fitted to the Loadascreen now in production is a Petter AV2.

While under test, and fitted with a 36 in. x 72 in. screen, the Loadascreen dealt with 72 tons of 1 in. sand and gravel an hour, and 123 tons of 3 in. sand and gravel an hour; 40 tons of 1 in. coal an hour, and 66 tons of 3 in. coal an hour. When fitted with a 48 in. x

96 in. screen, it dealt with up to 226 tons of sand and gravel an hour, and up to 122 tons of coal an hour.

An important feature of the screen is that it hinges back to a position beneath the boom for travelling, and can be folded back without disconnecting the drive. Travelling height of the 40 ft. conveyor is 11 ft. 6 in. Travelling height of the planned 50 ft. conveyor is 12 ft. 6 in.

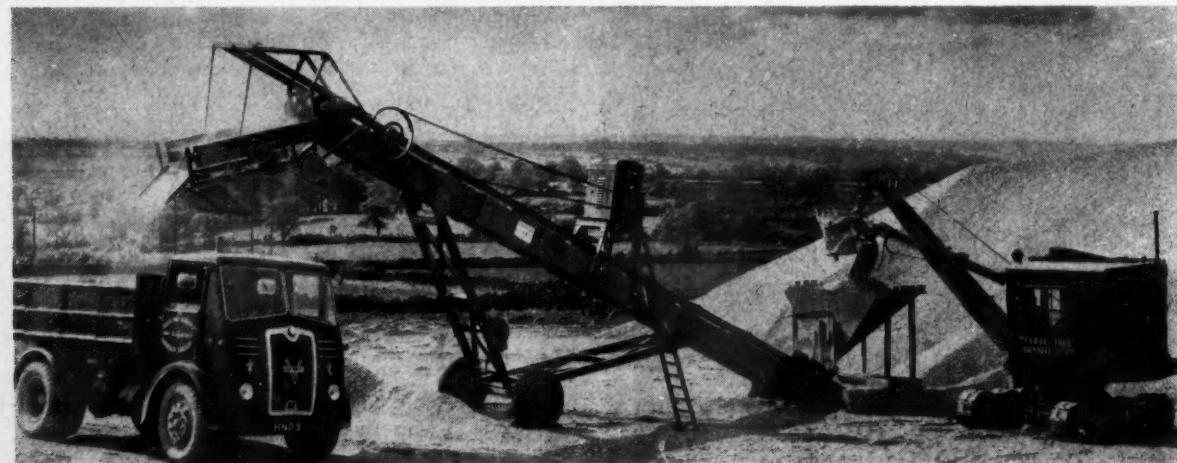
#### A NEW MAGNETOMETER

The discovery of a new type of magnetometer has been reported by a University of Michigan physicist.

The new device differs, it is claimed, markedly from previous types in utilizing helium in a special gaseous state called metastable helium, which makes possible a small and compact instrument. Also, unlike other instruments, it operates independently of temperature changes, thus eliminating the need for an oven to maintain it at a constant temperature. Little power is required and the lightweight device could be suspended under an aeroplane for mineral exploration, showing small variations in the magnetic field which can serve as indications to geologists of the presence of oil or mineral deposits.

#### HYDRAULIC PROPS IN METAL MINES

The Dowty hydraulic props of the coal mining industry are now finding increasing application in metal mines. They are in extensive use in South African gold



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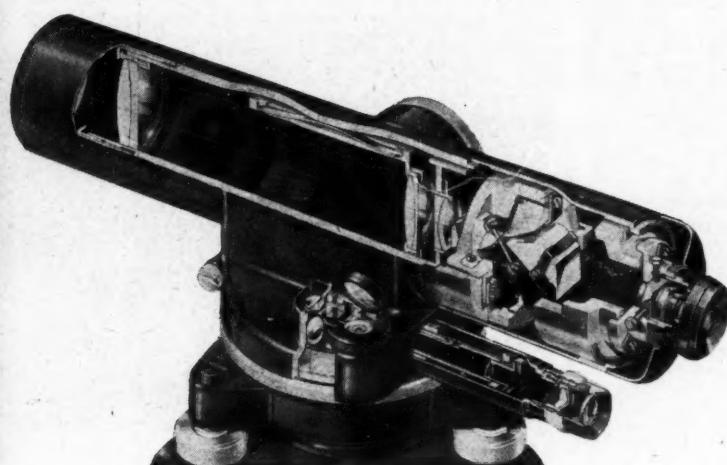
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Alongside, the internal construction of the self-setting level. Below, the Automat track brake man-riding car with hydraulic suspension

United States, as well as on widely different locations in the United Kingdom. Tests are still continuing on behalf of the N.C.B. in North Staffordshire. These extensive trials have been undertaken to confirm that these instruments will give accurate results in the field under all conditions, including wide variations of temperature. Between -30 deg. C. to +50 deg. C., the levels are consistently accurate.

Field experience shows that the use of these instruments doubles the speed of observation, reduces the risk of accidental error, and results in the saving of much time and fatigue. An accuracy of 0.02 ft. per mile is easily attained, whilst by taking the usual care associated with double levelling an average closing error per mile of 0.004 ft. is attainable.

Both companies are setting out into full production.

#### MAN-RIDING CARS

John Ingham and Sons Ltd. have recently patented their Automat track brake man-riding car with hydraulic suspension. A number of trains incorporating this feature have been supplied to several Divisions of the N.C.B.

The design claims 100 per cent safety, and of particular appeal is the absence of mechanical linkages between cars, and of complicated and inaccessible wearing parts. Furthermore, the hydraulic system controlling the cars fails to safety, under all circumstances, and there are no mechanical devices in the design which, through rust, neglect or wear, could interfere with the normal operation of a train.

An Ingham man-riding train consists of one master car, complete with a balanced Automat governor for each direction of incline, and any required number of brake cars. In the event of overspeed the Automat centrifugal governor on the master car comes into operation causing the brakes on all cars in the train to function in sequence, car by car, until full braking force is applied over the whole train.

Where, however, brake application has come about due to the manual operation of one of the emergency levers fitted in each car, the braking force is progressive

properties, notably Vlakfontein and Blyvooruitzicht, and are reported to have proved successful under arduous blasting conditions.

Hydraulic props are not, of course, considered expendable. Serviceable parts are salvaged and reassembled with new parts where necessary. Reconditioning is carried out at a Remploy plant in the United Kingdom.

#### SELF-ALIGNING LEVELS

Faced by the challenge of a European Common Market and increasing competition from further afield, two British manufacturers of optical surveying instruments have pooled their resources in the production of a self-aligning level. Despite the fact that, traditionally, the companies concerned manufacture equipments for the same industries—including the mining industry—on this occasion they have created a mutual interest. Interchangeable parts of the new unit can be constructed in either factory, sales being accomplished through the existing individual organizations in this country and abroad. In other respects, the companies' interests remain divergent.

The joint technical knowledge of the companies has produced a British automatic level. The technical and production staffs of Cooke, Troughton and Simms and Hilger and Watts have collaborated in the design and development of a novel and patented form of optical stabilizer which can be incorporated in the telescope of a surveyor's level in order to effect automatic compensation for any small errors in levelling. Thus the care which is necessary in setting up a conventional spirit-level instrument is no longer needed, and much time and fatigue is saved. Once the instrument has been approximately levelled by means of the circular spirit vial, the stabilizer sets the line of sight in a horizontal plane with precision, speed, and certainty. The instrument was shown to the Technical Press in London last Friday.

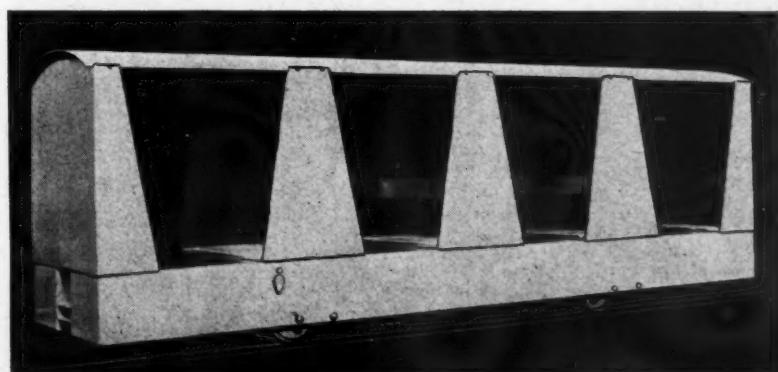
The method of compensation does not depend upon any need to magnify mechanically the residual tilt of the instrument, but obtains the equivalent correction by purely optical means, and this has advantages over other methods recently developed on the Continent. The moving part of this compensator carries

two reflecting prisms and is suspended by four flexible metal strips, forming a flexure pivot. This type of pivot is particularly suitable for this purpose, since it is frictionless yet robust; it can be operated an infinite number of times and yet returns unfailingly to the correct position, and it allows the compensator to come to rest in the vertical plane with a sensitivity of less than a second of arc in a fraction of a second of time. The flexible metal strips used in this pivot have a constant modulus of elasticity and they are so little stressed that the safety factor is 350 to 1.

Total movement of the swinging part of the compensator is restricted to 20 min. of arc by a damper which also serves to take the weight of the swinging prism mount when the instrument is in transit.

The telescope is of the internal focusing type, so constructed as to allow the stabilizer to be housed between the focusing lens and the reticle. By virtue of the prism system, the observer sees an erect view of the measuring staff. Each company has designed its own instrument around the common telescope and identical stabilizer unit, each having its own approach to the solution to the problems of the mechanical design.

To prove the instrument, it has already been extensively tested in the field, and all reports are commendable. The manufacturers have co-ordinated the dispersal of instruments to enable them to be used in, for example, South Africa, Kenya, Nigeria, Canada, Australia, and the



in each direction from that car, because those on either side are braked in sequence, to the extremities of the train. With either form of application the braking force is positive. The speed of application is pre-set to arrest the train smoothly and progressively and there is no danger of personnel being thrown out.

Each car is held in suspension by four Ingham combined hydraulic jack ram and neoprene rubber shock damping units situated over the axle boxes. The whole train is hydraulically intercoupled. Hydraulic control for the whole train is effected by the use of a heavy-duty pump unit located in the master car.

#### NEW-SHAPE INGOT

Aluminium Union Ltd., the distributors in the United Kingdom of Alcan aluminium, have introduced a radically new type of interlocking 50-lb. ingot which is safer, easier, and faster to handle during transport and by the users. This follows an extensive Alcan programme of development and testing in the field to secure the best ingot shape which would take full advantage of mechanical handling equipment.

Alcan regard the new design as the most significant advance in aluminium ingot shape since production of the metal began. They are in the process of converting completely to the new ingot as their standard for the 50-lb. form of 99.5 per cent aluminium, but meanwhile only limited quantities of the new ingot are available.

The new design ensures that in strapped bundles the ingots are locked together in the three dimensions, vertical, lateral, and lengthwise. Two metal straps serve to secure a neat bundle of forty ingots, making a convenient 2,000 lb. unit which stands up well to shocks in transit and can be stacked six-high with other bundles to form a stable pile. The straps, which are prevented from slipping by the wasp-waist design of the ingots, can readily be removed. The bundle is then free-standing and stable, and individual ingots can easily be lifted out for handling and furnace charging. Unstrapped bundles or part bundles can be moved by fork-lift truck.

Alongside, at right, the Drillmaster 300 P.A. Below, the Atlas Copco T2G loader-dumper



#### A COMBINED LOADER AND DUMPER

The Atlas Copco T2G combined loader and dumper, powered by compressed air, was developed originally by the authorities at the Montevicchio Mines, Sardinia, together with Atlas Copco engineers, for the purpose of handling broken ore in the overhand stopes. The machine comprises an overthrowing type of shovel loader mounted on a rubber-tyred dump wagon. The T2G is now being introduced to the British market.

The machine has a  $3\frac{1}{2}$  cu. ft. bucket, operated by a vane-type motor, and the front rocker bucket is pivoted so that its travel and as a result the headroom required for loading is reduced to a minimum. The shape of the bucket has been specially designed to obtain the maximum capacity when digging. The bucket is approximately the same width as the track of the front wheels, enabling the dumper to work through the muck pile continuously and leave a clean floor.

During a long test period at the Montevicchio mines a T2G machine is claimed to have loaded 20 cu. yds. of material per hour and transported it over a distance of 50 to 55 yds.

Bucket penetration and filling are facilitated, not only by the forward and

backward movements usual with the overthrowing type of loader, but also by the natural oscillation due to the elasticity of the tyres. The dumper can operate to distances of over 300 ft. from an air connection, and this feature can permit savings in mine development costs by reducing the number of ore passes or disposal chutes required in the working places.

The T2G has a turning radius of 4 ft. 10 in., a travelling speed of 3 ft. per second, and can be used fully loaded on inclines of up to 12 per cent. The body is tilted rearwards by a pneumatically operated ram, and is particularly suited for dumping materials into ore pass chutes and similar disposal points. The body capacity is 26 cu. ft. The Atlas Copco T2G loader-dumper will find many applications in underground mining where methods requiring or permitting the co-ordination of the loading, haulage, and dumping cycles are practised.

#### A NEW DESIGN OF TRACTOR DRILL

Designed primarily for quarry and opencast blast-hole drilling operations, the Drillmaster 300 P.A., mounted on a diesel-engined agricultural tractor, is claimed as ideal for operations in confined, difficult conditions such as are encountered in these locations. This rotary drill is manufactured by Hand-England Oilfield Equipment Ltd.

The tractor drill is a single machine covering the majority of drilling requirements of the quarry and opencast operator, the geologist, the mineralogist, and the geophysicist. A  $2\frac{1}{2}$  in. dia. hole has been adopted as standard in many quarries where  $1\frac{1}{2}$  in. and 2 in. dia. charges are being used. In broken formation, however, it may be necessary to drill larger holes 3 in. or 4 in. in diameter, or to ream out the  $2\frac{1}{2}$  in. dia. holes to these sizes, in order to lower the charge to the bottom of the hole. Special carbide-tipped  $2\frac{1}{2}$  in. dia. bits have been developed for use with the tractor drill, and "B" rod (1.29/32 in. o.d.) to U.S. Commercial Standard CS.17/47 are used with these bits.

For flushing the cuttings to the surface, an air compressor can be mounted directly on to the tractor drill and driven from the tractor engine. The compressor delivers 100 cu. ft. of free air per min., and achieves an up-hole annular velocity of 3,000 ft./min.



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## MINING MISCELLANY

Plans for the construction of a copper smelting plant in Egypt with a capital of £5,000,000 have been announced by the Minister for Industries for the Egyptian area of the United Arab Republic. It would have an annual capacity of 10,000 tons.

Initial contracts are being let in connection with the construction of a railway into the Wabush Lake iron ore area of Labrador. Wabush Lake Railway Co., which has been granted a railway franchise and right-of-way by the Newfoundland Government, is a subsidiary of Wabush Iron Co., whose shareholders are Steel Co. of Canada, Interlake Iron Corp., Pickands Mather, and Youngstown Sheet and Tube. Pickands Mather and Co., of Cleveland, are managing the iron ore project.

The Director-General, Mines Department of Thailand, stated recently that a foreign company with Thai participation had applied for permission to conduct a five-year survey for mineral oil in Thailand, and that the application was being studied by the Revolutionary Party.

The State-owned copper works, Outokumpu, Finland, has started to develop a new lead mine at Korsnaes, near Vaasa. It is anticipated that some 100,000 tonnes of ore will be extracted each year, and that lead metal output will reach 4,200 tons annually.

Preliminary estimates show that Polish collieries very considerably exceeded the yearly plan fixed at 93,500,000 tonnes of coal. Additional output brought the total produced in 1958 to nearly 95,000,000 tonnes.

The gold mine at Krabinburi, Thailand, has become flooded following suspension of operations by the Mines Department, and in order to restart operations a further allocation of 50,000,000 Baht is needed. A French company has offered to work the mine, but the Mines Department stipulate Thai participation in the enterprise.

Turkey's new electrolytic copper plant will begin operating early this year. The civil engineering of the plant has been completed, and machinery and other equipment is now being installed. With an estimated annual output of some 4,000 tonnes, the new plant will produce sufficient electrolytic copper to meet Turkey's requirements.

The Federation of Malaya and the Philippines have agreed on the need for closer economic and cultural co-operation between the two countries, according to an official joint communiqué. The communiqué followed talks between Sr. Carlos Garcia, the Philippine President, and Tunku Abdul Rahman, the Malayan Prime Minister. The announcement also said the two leaders had agreed to give assurances to foreign investors of appropriate protection and adequate returns for participation in the economic and industrial development of the two countries.

A copper strike near the Snowy River, on the Victorian-New South Wales east-

ern border, Australia, could be one of the richest in the country, the curator of minerals at the Australian Museum, Mr. R. Chalmers, has stated. The ore is reported to have yielded between 2 and 3 cwt. of copper per ton. Mr. Chalmers said the Snowy River strike was remarkable because the region previously had not produced minerals.

The vice-president and the chief geologist of an American firm arrived in Warsaw, Poland, on October 17, at the invitation of the Chemical Industry, to inspect the Tarnobrzeg sulphur district and the Wieliczka salt mine.

The Chalhan lake in the Tsaidam basin in Chinghai Province of China, covering an area of 1,600 sq. km., is rich in potassium chloride, sodium chloride, and magnesium chloride. These salts have formed a hard crust on the surface of the lake strong enough to support the building of a local fertilizer factory. Output from the latter is expected to rise to 200,000 tons next year.

A trial run recently at the Potash Co. of America plant near Saskatoon, Saskatchewan, Canada, saw the first large-scale extraction of potash ore from the mine workings some 3,300 ft. underground. The ore brought to the surface at the P.C.A. plant marked the first time potash has been mined in Canada.

Prospecting for coal is to be speeded up in the southern provinces of China. The Ministry of the Coal Industry regards the distribution of industry as unbalanced, the most productive coalfields being still situated in the north-east and north. The transport of additional supplies of coal from north to south for the latter's iron and steel production campaign has imposed a further strain recently on China's communications.

A new producer, United Uranium N.L., in the Northern Territory, Australia, is expected to commence export of uranium oxide by the end of March next. The company has a contract with the United Kingdom Atomic Energy Authority to deliver uranium oxide to the value of £A5,000,000. In 1959, it is expected that products to the value of £A450,000 will be exported, and that the annual rate of export will then be £A900,000 worth. Total quantity under contract will be delivered by the end of 1965. Dividends paid from profit on uranium production in Australia are tax-free.

Sandviken's Ironworks, Sweden, has obtained a permit for the erection of a new factory for the manufacture of tungsten oxide at Västberga, near Stockholm. The new factory will be adjacent to Sandviken's hard-metal factory.

A delegation of the German Krupp concern is reported to have visited Ponferrada, Spain, where they examined the iron ore deposits of San Jose.

Ministry of Power approval numbers have been obtained for certain types of underground locomotives. They are diesel locomotives manufactured by Hudswell Clarke, Hunslet Engine, and

North British Loco, and battery locomotives manufactured by E. E. Baguley and Greenwood and Batley.

A series of reviews of employment conditions in the Northern Region is contained in a booklet issued by the North-East Industrial and Development Association. In the older basic industries there has been a small decline since 1948 in absolute numbers and in the percentage of persons engaged in the industries, as a proportion of all insured workers in the region. Within this group, the most marked fall has been in the extractive branches of coal mining and iron ore mining and quarrying from 15.5 per cent of the total insured population of the region in 1948 to 14.8 per cent in 1957.

Brazilian aluminium output is to be raised to 42,500 tonnes by 1962 on the basis of plans worked out by the Kaiser and Aluminio do Brasil companies. It is estimated that current output is about 8,000 tonnes annually and covers only about one-third of the country's requirements. Rich bauxite deposits have been found in the areas of Pocos de Caldas, Ouro Preto, and Serra da Mutuca, all in Minas Gerais State.

### PERSONAL

Sir William Scott, O.B.E., M.I.Mech.E., M.I.P.E., J.P., managing director of Armstrong Whitworth (Metal Industries) Ltd., and Sir Richard Bellingham Graham, Bt., O.B.E., J.P., have been appointed directors of Head Wrightson Teesdale Ltd., a subsidiary company of Head Wrightson and Co. Ltd.

Mr. A. R. C. Fowler has been appointed a consulting engineer of Rand Mines Ltd.

Mr. A. J. Brink has been made general manager of Bancroft Mine.

Mr. F. G. Charlesworth has been appointed chairman of Malayan Tin Dredging Ltd., Southern Malayan Tin Dredging Ltd., and Kramat Pulai Ltd.

Mr. H. E. Barrenger has been appointed a director of Tronoh Mines Ltd. and Southern Tronoh Tin Dredging Ltd. He has also been appointed a director of Kramat Pulai Ltd.

Mr. C. Waite has been appointed a director of Malayan Tin Dredging Ltd. and Southern Malayan Tin Dredging Ltd.

### COMPANY EVENTS

As from January 10, 1959, the new address of Knapp and Bates Ltd. will be 14-17 Finsbury Court, Finsbury Pavement, London, E.C.2. The new telephone number will be Monarch 0840.

The board of British Thermoplastics and Rubber Manufacturers Ltd. has reached an agreement in principle whereby the company acquires the whole of the capital of Microcell Ltd. and of the

associated companies, Glass Yarns and Deeside Fabrics Ltd. and Artrite Resins Ltd. Mr. Henry Kremer, chairman and managing director of Microcell Ltd., will continue in that capacity and will join the board of BTR Industries Ltd.

As from January 12, 1959, the new address of Deering Products Ltd. is 14 Great Smith Street, London, S.W.1. The new telephone number is Abbey 2681.

#### CONFERENCES AND EXHIBITIONS

"The Ageless Diamond" Exhibition is being held at Christie's saleroom from January 9 to January 28. Sponsored by Christie's and De Beers Consolidated Mines, the exhibition includes a special section devoted to the mining industry. There are reliefs showing the central washing plant of De Beers Consolidated Mines at Kimberley, and the giant rotary scoop moving sand overburden on to a portable stack. Illuminated scenes depict the processes of washing and recovery and diamondiferous gravels from prospecting trenches being screened in a hand-operated trommel. The huge quantities of rock excavated in the search for diamonds that form into mountains of waste are illustrated, and photographs show the miner at work and drilling underground. A feature of the mining section is a table model of Kimberley and the surrounding district, 6 ft. long by 3 ft. wide, showing the position of pipelines and dumps. The cutting and shaping of an actual diamond can also be seen by the public in another part of the exhibition.

A course of ten lectures, "Mining in Great Britain II," will take place at King's College, Newcastle, beginning January 15, 1959. The lectures are to be given every Thursday at 7 p.m. by the University of Durham, Department of Extra-Mural Studies.

The following meetings are taking place: The Midland Institute of Mining Engineers, Doncaster (Danum Hotel), Thursday, February 5, 1959, at 2.30 p.m. The Mining Institute of Scotland: Glasgow (Royal College of Science and Technology), Wednesday, January 21, 1959, at 5.15 p.m. The Mining Institute of Scotland: Edinburgh (Mining Laboratories, 79 Grassmarket), Wednesday, February 18, 1959, at 5.15 p.m. The North of England Institute of Mining and Mechanical Engineers: Newcastle upon Tyne (the Institute, Neville Hall), Saturday, February 7, 1959, at 2.30 p.m. The South Staffordshire and Warwickshire Institute of Mining Engineers: Tamworth (Castle Hotel), Tuesday, January 27, 1959, at 6.30 p.m. The South Wales Institute of Engineers: Cardiff (Park Hotel), Thursday, January 15, 1959, at 7 p.m. Annual Dinner. The Southern Counties Institute of Mining Engineers: London (3 Grosvenor Crescent, S.W.1), Friday, February 13, 1959, at 3.30 p.m.

#### CONTRACTS AND TENDERS

##### Ceylon

Five thousand long tons of rock gypsum, as specified. Issuing authority and address to which bids should be sent: General Manager, Kankesan Cement Works Corporation, 49/17 Iceland Buildings, Colombo 3. Closing date, January 19, 1959. Ref. E.S.B. 32161/58. Telephone inquiries to Chancery 4411, extension 738 or 771.



Export by Ruston-Bucyrus Ltd. of £112,000 worth of their excavators is shown here. The order, comprising four 30-RB 1-yd. (air-control) shovels, with three extra dragshovel equipments, four 22-RB shovels, and four 22-RB dragshovels, and one 19-RB dragshovel, was received during December, 1958, from the Swedish distributors, Tornborg and Lundberg. In the case of most of the machines only a few days lapsed before loading.

#### The Mining Machinery Exhibition

Additional information is now to hand regarding the Mining Machinery Exhibition to be held at Olympia, London, from July 9 to 18. The exhibition may provide the most comprehensive display of underground mining machinery and ancillary equipment ever presented in Britain.

The ten years which have elapsed since the last exhibition organized by the Council of Underground Machinery Manufacturers was staged, in London, has been a period of intense development in the design and use of mining equipment of all descriptions. Today, with increased output coming from the factories and the declining needs of the N.C.B., the Council consider the time opportune to demonstrate to the world the immense strides this specialized industry has made in recent times.

The exhibits on nearly one hundred stands will cover all kinds of underground equipment required by mining undertakings of all types throughout the world. The applications of hydraulics in mining enterprises of every description will be fully demonstrated. Great progress has been made recently in this branch of mining engineering, of which British manufacturers have made a particular study. Many examples of hydraulic powered machinery will be on view at Olympia.

New developments from British factories will be displayed, including improved power loaders with continuously rated water-cooled motors and new designs of feeder conveyors. The latest types of drilling, cutting, conveying, and loading machinery will also be shown, not only for use in coal but metal mines in all parts of the world. Among the applications of hydraulics to be seen will be power packs on roadside driving at the coal face and hydraulic self-advancing roof supports.

In addition to the members of the C.U.M.M. whom we listed as exhibitors in our article on the exhibition in our

December 12 issue, a first list is now available of non-members of the C.U.M.M. who will also be exhibiting:

Acrow Engineers Ltd., Alkaline Batteries Ltd., W. G. Allen and Sons (Tipperary) Ltd., Atlas Copco (G.B.) Ltd., Automatic Telephone and Electric Co. Ltd., Aveling-Barford Ltd., Bonser Tristram Ltd., British Insulated Callender's Cables Ltd., Brush Electrical Engineering Co. Ltd., Cable Belt Ltd., Malcolm Campbell (Plastics) Ltd., Catalin Ltd., Combustion Instruments, Conflow Ltd., Crawley Industrial Products Ltd., John Davis and Son (Derby) Ltd., W. E. and F. Dobson Ltd., Dosco Overseas Engineering Ltd., Dunlop Rubber Co. Ltd., Edibrac Ltd., Electricals Ltd., Electric Hose and Rubber Co. Ltd., J. H. Fenner and Co. Ltd., Fisher and Ludlow Ltd., Fluidrive Engineering Co. Ltd., Glover Bros. (Mossley) Ltd., Hickson's Timber Impregnation Co. (G.B.) Ltd., Johnson and Phillips Ltd., Keelavite Rotary Pumps and Motors Ltd., Laurence Scott and Electromotors Ltd., H. Lindley Ltd., Alexander Marcar and Co. Ltd., Olin Mathieson Ltd., Megator Pumps and Compressors Ltd., Mine Safety Appliances Co. Ltd., Mono Pumps Ltd., Oldham and Sons Ltd., Padley and Venables Ltd., Pollard Bearings Ltd., The Rawlplug Co. Ltd., Revol Ltd., A. Reyrolle and Co. Ltd., Riverside Engineering Co. Ltd., Rubber Improvement Ltd., Sheepbridge Engineering Ltd., S. D. Dickson, Steel Props and Mining Equipment Ltd., Stein Atkinson Vickers Hydraulics Ltd., F. Taylor and Sons (Manchester) Ltd., E. C. Theedam Ltd., The Wallacetown Engineering Co. Ltd., Ward's Flexible Rod Co. Ltd., Watson and McLean Ltd., Westinghouse Brake and Signal Co. Ltd., West's Gas Improvement Co. Ltd., A. G. Wild and Co. Ltd., Edward William. An interesting exhibit will be that of the National Coal Board.

*The Mining Journal* along with several other technical publications will also have a stand at the exhibition.

## Metals and Minerals

# Prospects for the Ferro-Alloy Metals

The year 1959 offers brighter prospects for producers and exporters of the ferro-alloy metals and minerals, since trends in new orders and shipments indicate a continuing recovery in the American steel industry. The improvement in United States steel production is already reflected by an upward trend in the output of ferro-alloys, which may be expected to continue. According to the Business and Defence Services Administration of the U.S. Department of Commerce, the production of ferro-alloys in the first nine months of 1958 was about 33 per cent lower than in the corresponding period of 1957. The upward trend in activities became discernible in June last year and has resulted in a present production rate of about 75 per cent of capacity. Estimated United States production this year is approximately 2,440,000 s.tons, with shipments at about 2,340,000 s.tons, exceeding the respective 1958 totals of 1,665,000 tons and 1,590,000 tons by approximately 25 per cent.

Shipments of stainless-steel products are also expected substantially to exceed those of last year, and they may even top the 1957 levels. With assured and ample supplies of raw materials, stainless is in a position to extend its traditional markets and develop new uses, with corresponding gains in the consumption of nickel, chromium, and manganese.

In assessing the immediate outlook for the ferro-alloy metals, optimism must be tempered by the existing stock position. Stocks of manganese ore in the principal consuming countries remain high. In the United Kingdom they are understood to represent about six months of requirements, most of them being high grade. The United Kingdom is understood to have completed contracts with producing countries for the current year, including the U.S.S.R., and in view of the stocks held it seems reasonable to assume that this year's contracts are for smaller tonnages than were those of 1958.

Two years ago, ore prices were about twice today's level, but at this stage it is scarcely possible to envisage a return to these conditions, even should there be a useful revival of world demand. Until stocks have been whittled down to more normal levels, the overall volume of demand is likely to remain subdued.

Another factor to be borne in mind is that the spectacular rise in Brazil's manganese ore production has made itself felt on the world market, while the U.S.S.R. is also a producer to be reckoned with. Indian exports are being very seriously affected by competition from these countries, despite India's removal of the export duty in late November. To such an extent have Indian manganese ores been piling up that both high-grade and low-grade output is to be further cut back, and in some areas production is being entirely suspended.

Opinion now inclines to the belief that the agreement for the barter of United States wheat for Indian ore and ferromanganese may be signed after all. It remains to be seen, however, what effect the deal, if finalized, will have on market

sentiment. In view of current conditions, this transaction may do little to inject greater confidence into the market, since it could mean little more than a change in the disposition of stocks.

So far there has been no significant change in chrome ore's fortunes. A satisfactory level of inquiries is reported, but actual business maturing is not as yet very impressive. In general, however, it is to be expected that the improving prospects for the United States steel industry will in turn benefit chrome.

At the end of October last year, calculations based on the available data indicated the probability that stocks of nickel outside the United States stockpile, including all North American producers' stocks, should total at least 150,000 and possibly 175,000 s.tons. Despite the three-month strike at International Nickel's Sudbury works, the stock position must still remain very comfortable, and demand is expected to improve quite quickly following the upturn in the United States economy. Particularly significant for nickel is the encouraging outlook for stainless steel, which at present accounts for about 30 per cent of nickel purchased.

A reminder that wolfram is not yet out of the wood is afforded by the slight easing in prices, which are currently quoted in London at 92s. 6d. to 97s. 6d. per 1-ton unit c.i.f. Europe, after having remained for some weeks at 95s. to 100s. There can be little doubt, however, that stocks of wolfram in Europe are at a low level, while latterly there has been a definite increase in foreign orders, chiefly from the United States. Earlier last year United States buyers were satisfying their requirements from domestic sources, but with the upturn in United States steel production and the steady decline in the domestic tungsten output, there has been a revival in the United States demand for foreign ore. Tungsten—in common with chrome and nickel—will also benefit from the expanding demand for high-temperature metals.

While the outlook for wolfram and scheelite has certainly brightened considerably, there is little cause for satisfaction until demand has recovered sufficiently for some revival in production to take place.

## THE PLATINUM MARKETS

Both in London and New York, the platinum markets have started the current year very quietly, with trading at a low ebb. The recent ending of the three-month strike at International Nickel—a leading producer of platinum group metals as well as of nickel and copper—must inevitably accentuate the present situation of oversupply. Russia, although not pressing, remains a potentially large seller of the metal, while the possibility cannot be excluded that the United States Government may dispose of a further large quantity of platinum (last November, the United States Army sold 22,000 oz. of scrap platinum).

So far as the free market in the United

Kingdom is concerned, trading so far this year has failed to show any signs of broadening. Any business passing has been confined to small quantities, and no big parcels have changed hands. While there is no great pressure to sell, the low level of buying interest is still tending to depress prices, and the market is now indicated at £17 5s. to £17 15s., against £17 5s. to £18 previously. Current prices are about half those ruling two years ago and at the present moment there seems little to suggest any immediate reversal of the downward trend.

The New York market also opened the New Year with no indication of increased activity. Leading refiners still adhered to their officially advertised asking rate of \$52 a troy oz. in bulk and \$55 in lesser quantities. Outside market dealers continued to offer metal at \$51 or even a little lower. Further easiness was caused by local rumours of a shift in the Soviet Administration of platinum sales. Demand in the United States has shown no signs of improving.

The futures market on the New York Mercantile Exchange remains inactive.

## U.S. COLUMBIUM-TANTALUM

The United States columbium-tantalum industry continued to expand in 1958, according to the Bureau of Mines. Several new metallurgical plants were completed or under construction, and domestic ore production continued at the high level attained in 1957. Domestic production of columbium-tantalum mineral concentrates increased slightly during the year. Domestic production of columbium metal is estimated to have tripled in 1958 and that of tantalum metal to have increased moderately in the same period.

## ZIRCONIUM IN THE U.S.

The Bureau of Mines, U.S. Department of the Interior, reports that the domestic zirconium industry achieved a state of balance last year when, for the first time, production overtook demand. Sponge producers approached capacity operation. Melting and fabrication facilities were more than adequate to handle the sponge produced. Led by Westinghouse Co. and Allegheny Ludlum Steel Corporation, thirty companies were producing various zirconium shapes. Almost the sole use for the metal was as a structural material for nuclear reactors.

Of the 1,510 s.tons of zirconium sponge produced in 1958, about 10 tons was commercial grade. About 150 tons of reactor-grade sponge was imported from Japan.

Production of zircon was 26,100 tons against 56,802 in 1957 and imports were 17,300 tons against 41,692 tons.

Hafnium output in 1958 is estimated at 23 s.tons in terms of contained metal.

## RUSSIAN NICKEL PURCHASES

Soviet purchases of nickel in the open market are reported to be under intensive study by various government agencies in the United States, as well as by Congressional groups. Russia's mine production of nickel is placed at around 50,000 tonnes, or nearly one-fourth of the Free World output.

Various theories have been put forward to account for Russian buying. One

suggestion is that the U.S.S.R. is acquiring nickel at cut rates with a view to eventual dumping to disrupt world trade, while other authorities believe that the nickel is being stockpiled for military uses.

It is also thought that the Soviet Union may not have realized the amount of nickel originally projected from the Petsamo mines in Finland, and may therefore have been forced into the open market to fill its needs. In this connection, attention has been drawn to the possibility that the Soviet's nickel de-

posits south of the Ural Mountains have not yet been developed sufficiently to meet even the civilian demands. Another possible explanation is that the U.S.S.R. is accumulating nickel with the intention of forcing some Free World nations to turn to them in the (surely improbable) event of a world shortage.

How far any or all of these solutions is the correct answer must remain a matter for speculation, but Congressional sources are reported as stating that an attempt to dump nickel could not be discounted.

understood there have been conversations between American and Canadian officials. Yet, in spite of this, the general opinion still remains that nothing is likely to come from such a meeting. There are reports of barter business being transacted involving further tonnages of lead, but as these appear to be difficult it may be that some surplus metal will have to be sold and delivered on the London Metal Exchange. This should lead both to a weakening in the price and also to a widening of the contango. In the zinc market, however, the tonnage of metal available is very much less and it appears that the existing backwardation is likely to be maintained for some months to come.

The U.S. Bureau of Mines' latest figures show that supplies of new lead in the U.S. in October, amounted to 93,900 s.tons and against this only 92,500 tons were consumed; this figure, however, represents a 3 per cent gain over September and was the highest consumption so far recorded for 1958. There was a slight increase in stocks but through re-distribution producers' stocks registered a decline for the first time for over a year, which was counterbalanced by increases at consumers' works and at secondary smelters. Production of lead in O.E.E.C. countries amounted to 55,812 tonnes during November, about 2,000 tons below the October figure.

The American Zinc Institute issued figures covering the month of December showing a production of 75,503 s.tons, which is an increase of over 10,000 tons from the November figure, total deliveries at 77,010 tons, which is a decline of about 6,500 tons from the previous month, but in spite of this stocks declined some 1,500 tons to 190,237 tons. The zinc production in O.E.E.C. countries totalled 67,566 tonnes in November compared with 68,643 tonnes in October.

## COPPER · TIN · LEAD · ZINC

(From Our London Metal Exchange Correspondent)

The firm undertone in all markets continues, and with consumers throughout the world taking more interest it is expected that present price levels will be maintained, and in the case of copper, probably raised.

### COPPER MOVES HIGHER

On the London Metal Exchange copper prices have risen appreciably and the establishment of the backwardation has become more firm with the further reduction in stocks to their lowest level for some considerable period. The tonnage at the beginning of the week was only 4,696 tons, a drop of a further 575 tons from the previous week. With conditions as they are in world markets, it appears as if the London price will now have to stage a further rally to a sufficient extent to attract copper once more to London. As sentiment all round is good this may lead to a general raising of price levels throughout the world.

During the last week the U.S. customs smelters have raised their quotation by ½ c. per lb. to 29½ c. per lb., and have made a corresponding upward adjustment in the price they are paying for the basic grade of scrap which now stands at 24 c. per lb. Business is reported as satisfactory, but at the present moment there are few indications that the producers are considering raising their price, which remains at 29 c. per lb.

In Europe, demand is also satisfactory and the Belgian price has been raised in sympathy with the rises in London and New York and now stands at the equivalent of approximately 29.05 c. per lb., Antwerp or New York. General opinion in London is that the copper price should rise gently but steadily for the next few months but after that some doubt is expressed as to whether production will once more exceed offtake.

That the latter possibility can by no means be regarded as remote is indicated by the Copper Institute figures for December, which also underlines the difference between the situation in the United States, where stocks have again fallen despite rising production, and that existing in the rest of the world, where increased output is being accompanied by rising stocks. In the U.S., production of refined copper rose by 18,930 s.tons to a total of 146,978 tons, in spite of which stocks fell by 13,234 tons to 80,722 tons. Outside the U.S., production at 135,213 tons was 33,152 tons higher, while at the

same time stocks increased by 42,985 tons to a total of 178,152 tons.

### TIN STOCKS FALL AGAIN

The tin market remains uncertain, but here again stocks showed a further fall at the beginning of the week to 15,451 tons, a reduction of 467 tons from the previous figure. Consumer demand is spasmodic, but most reports indicate that it increases where prices fall back only a few pounds a ton and it is expected that as the quota period progresses the market will once more develop a firmer tone.

The latest figures issued by the International Tin Council indicate that world output of tin in concentrates for October showed little change over the previous month at 11,200 l.tons. At the same time it was indicated that world stocks during 1958 rose about 16 per cent and that most of this took place in producing countries. This is what one would expect with the export restrictions which are now in force. On Thursday the Eastern price was equivalent to £783½ per ton c.i.f. Europe.

### U.S. LEAD-ZINC QUOTAS TO REMAIN

Although lead and zinc have shown little change pricewise, the situation which is developing is one of great interest and various announcements and figures which have been published during the last week indicate that the two markets are about to enter upon a period when there may be surplus supplies which have to be disposed of in London unless more barter transactions take place than is at present expected. Firstly, Mr. Seaton said that he plans to continue import quotas for lead and zinc for some considerable period and that he does not intend to propose any alternative scheme to Congress during this session. At the same time the first figures were issued of entries of lead and zinc during the new quota period. These showed that already the quota of lead for "other countries" and the quotas for zinc from Belgium and "other countries" were filled almost on the first day. Many other quotas were taken up to a large extent and it appears that all quotas are likely to be filled well before the end of the period.

It is announced that a third international conference will be held in January to discuss problems of the lead and zinc industries and in the meantime it is

### U.K. METAL STATISTICS

The British Bureau of Non-Ferrous Metal Statistics issued the following figures for the U.K. for the month of October (the September figures are given in parentheses). Copper consumption increased at 65,190 l.tons (61,408); stocks of copper declined to 74,686 tons (85,092 tons). Tin consumption showed a rise at 2,072 (1,784) whilst stocks rose only slightly to 20,135 (19,942). Lead consumption rose to 31,356 (28,829) and stocks fell to 40,216 (48,865). Zinc consumption rose to 29,838 (26,747) and stocks declined to 39,341 (45,784).

Closing prices are as follows :

	Jan. 8		Jan. 15	
	Buyers	Sellers	Buyers	Sellers
<b>COPPER</b>				
Cash	£222½	£222½	£229	£229½
Three months	£221½	£222	£226	£226½
Settlement	£222½		£229½	
Week's turnover	9,625 tons		13,700 tons	
<b>TIN</b>				
Cash	£755	£756	£756	£756½
Three months	£757	£757½	£77	£77½
Settlement	£756		£756½	
Week's turnover	480 tons		715 tons	
<b>ZINC</b>				
Current ½ month	£75	£75½	£75½	£75½
Three months	£72½	£72½	£73½	£73½
Week's turnover	7,800 tons		6,272 tons	

London Metal and Ore Prices appear on page 74.

**Mining Finance**

## The O.F.S. Comes of Age

At this time of year the publication of the annual reports of the Anglo American group's O.F.S. mines makes it possible to put into perspective the year's operations in this goldfield, and to relate past progress to future probabilities. Now that President Brand has joined the ranks of the taxpayers, and with all five mines paying dividends (albeit nominal in one case), it would be true to say that the adolescence of the field is over.

A sense of this approaching maturity is present in the circulated statements by Mr. S. Spiro, chairman of the five mines. Nevertheless, although production from the O.F.S. field has now passed the 15,000,000 fine oz. mark (worth more than £180,000,000), a great deal of work remains before the full potential of the area can be realized. Thus, in his addresses to President Brand and President Steyn, Mr. Spiro referred to the new shafts which are to be sunk to exploit the ground which will be made available by the proposed realignment of boundaries to coincide with the Ararat fault, enabling the mills each to crush 140,000 tons per month. The cost of the Steyn shaft, including the mill extensions, etc., will be in the region of £4,750,000, of which more than £3,000,000 will be appropriated from profits. Comparing this figure with profits, which in 1958 were running at about £3,200,000 per annum before any charges, it is apparent that to anticipate any increase over the present dividend rate of 2s. 6d. per annum during the next year or two would be over-optimistic, although there is no reason to believe that any further cut is likely.

The dividend position at President Brand would be further complicated by the incidence of taxation (which has become payable in only the tenth year of the company's existence) were it not for the fact that Mr. Spiro made a point of saying that profits available for distribution should be unaffected by tax liability. This is a result of nice timing by the consulting engineers, who have managed

to arrange things so that increasing taxation commitments are counterbalanced by increasing profits, coupled with allowances against expenditure on the new shaft.

It may also be that profits in the coming year will benefit from a reduction of costs consequent on a reduction of advance reef development. The presence of shale in the hanging wall has caused the collapse of raises before stoping operations have commenced. In future, therefore, the number of raise connections opened up in advance of stoping will be kept to a minimum.

Of most significance in the *Welkom* report are the strong indications that new capital will be necessary in the comparatively near future. (See this column last week.) Also of interest are the plans for increasing the milling rate while simultaneously stepping up the amount of waste sorted to about 12 per cent. This rate of sorting might mean a mill recovery of 6½ dwt., so that *Welkom* is at least beginning to justify the stringent lease formula (by comparison with the President mines), which implied a high opinion on the part of the government engineer. Here again, however, it is too early to look for an improvement in the current 6d. per annum dividend.

Prospects of increased dividends from the O.F.S. market leaders, *Western Holdings* and *Free State Geduld*, are much brighter. At both mines, the mill grade continues to improve, profits to rise, and the future is assured by large and increasing ore reserves of steadily better grade, backed by development disclosures of the highest order. Against this must be set, in the case of *Western Holdings*, the fact that taxation is likely to begin siphoning off profits towards the end of the current financial year, while at *Free State Geduld* the current shaft-sinking programme will not be completed before next June.

In spite of this, F.S.G.'s estimated capital expenditure for 1958-59 is put at

Part of the reduction plant at President Steyn



only £600,000, so that the chances of a continuing improvement in dividends must be rated very high. The prospect of taxation at Holdings, on the other hand, read in conjunction with the plans for expansion to 150,000 tons capacity during the early part of 1959, means that although there may well be some advance on last year's 7s. per share, no startling lift should be looked for.

With regard to the so-called "jackpot area" surrounding the Geduld 1 borehole, Mr. Spiro makes it quite clear that neither F.S.G. nor Holdings has any intention of rushing for the bonanza at the expense of normal development work. Nevertheless, both mines are now driving quite speedily in the direction of the borehole, so development results in the current year might well repay close scrutiny.

Two points of general interest to investors in O.F.S. mines were also discussed by Mr. Spiro in his various addresses. On the subject of native labour, he said that the usual seasonal decline, which normally reaches its climax at the turn of the year, failed to materialize for once. This means that, in general, milling rates in the December quarter were higher than those planned—a part explanation of the succession of record working profits announced in recent monthly returns. Referring to the experimental mine-water demineralization plant on the Free State Geduld property, Mr. Spiro revealed that testing began in November, and that it was hoped to commission the plant fully in the near future. The only bogey remaining unaided is the question of cost now that the technical success of the plant, according to Mr. Spiro, appears assured. The plant will shortly begin supplying the water needs of the *Welkom* uranium plant. Subject to the question of costs, mine water might be the foundation of a less one-sided economy in the O.F.S.

Mr. Spiro's statements appear on pages 76 to 80.

### COPPERBELT PRODUCTION FORECASTS

At yesterday's informal meeting of the R.S.T. Group, Sir Ronald Prain, the chairman, said that as a result of the recent strike neither Roan Antelope nor Mufulira would achieve their production targets in the current financial year.

Production from Mufulira should total about 86,000 tons, compared with a target of 93,000 tons, said Sir Ronald, while Roan Antelope is expected to produce 77,500 tons, a shortfall of 2,500 tons. It is expected that these outputs will be sold in full, together with an estimated 18,000 tons from Chibuluma.

Referring to Chambishi, Sir Ronald revealed that a new two-year drilling programme has been authorized. The programme is intended to show whether it would be possible to start Chambishi as an open pit proposition followed later by underground operations.

### KILEMBE RIGHTS ISSUE

In referring to a forthcoming rights issue under this heading last week, it was stated that the issue was to be made by Kilembe Mines. In fact, the issue is being made by Kilembe Copper-Cobalt. Frobisher Ltd., the Canadian mining house, has a 77 per cent interest in Kilembe Copper-Cobalt, which in turn holds 70 per cent of the shares in

Kilembe Mines. The interests of the Colonial Development Corporation and the Uganda Government are, as stated, in Kilembe Mines, and not in Kilembe Copper-Cobalt.

## **ASHANTI/BIBIANI PRELIMINARIES**

Preliminary results from Ashanti and Bibiani (1927) show that in both cases taxation was responsible for increased profits in 1957-8. Ashanti's profits rose from £747,811 after tax to £1,025,755 (the latter figure including a tax write-back of £230,000), while Bibiani's earnings were almost £10,000 higher at £64,295.

As stated last week, the recommended final dividend of Ashanti is 1s. 6d. (including a bonus of 6d.) to make 2s. 6d. for 1957/8 against 1s. 10d. (partly on a lower capital) last year, but the Bibianini final of 2.4d. makes an unchanged total of 4.8d. Ashanti is also proposing a 1-for-3 scrip issue.

**Petaling Tin.**—During the quarter ended December 31, Petaling Tin continued to operate one dredge only, the No. 6; Nos. 3 and 4 remained shut down on a care-and-maintenance basis as a result of production limitation. The No. 6 dredge itself was shut down at the end of November, when the quota had been filled and some stocks accumulated.

**A.S.A.I.C. May Buy Bills.**—Because the American-South African Investment Co. has funds which, it believes, cannot be invested in long-term securities for some time, it has applied to the U.S. Securities and Exchange Commission for permission to deal in South African Treasury Bills.

**No Quorum For Rand Leases Capital Proposals.**—The E.G.M. called by Rand Leases on January 9 to consider the repayment of 9d. per share was adjourned for six days because the necessary quorum was not present.

**O.F.S. and Klerksdorp Labour Troubles.**—There have been outbreaks of trouble in the compounds of two S.A. gold mines. At Hartebeesfontein, a 1½-hr. tribal clash resulted in the deaths of four Africans and injuries to another 24. Shift turn-out on the following day was normal. At Virginia there was serious rioting, as a result of which over 400 Africans were arrested.

**Lake George Life Doubts.**—After discussing the year's development work in his speech from the chair, Mr. R. M. P. Preston, chairman of Lake George Mining Corporation, whose annual meeting was held this week, said that although all reasonable exploration schemes are being persevered with, results to-date of the deep drilling programme have done nothing to raise hopes of finding the new ore so essential to the continued life of the mine.

**Jos Tin Changes Name.**—At an extraordinary meeting following the annual meeting of Jos Tin (reported on page 81) resolutions were passed authorizing the proposed one-for-one scrip issue, amending the articles of association, and changing the name of the company to **Jos Holdings**.

**New Kleinfontein.**—In last week's tabulation of S.A. Gold returns, the profit of New Kleinfontein for the year to December 31, 1957, was given as 44.0. This should have read L420.

(Continued on page 80)

## LONDON MARKET HIGHLIGHTS

South African gold shares were firm enough for the first few days of the week, but began to soften in front of a not very inspiring batch of quarterly reports emanating from the Anglo American group.

Lorraine, however, staged a good recovery after their previous weakness, and regained 4s. to 27s. 6d. at one time. Much of the improvement stemmed from the undoing of call options on the shares, a factor which was also at work in Free State Geduld (115s.). Hartebeest became a rather hesitant market. Already unsettled by reports of labour disturbances at the mine, the shares (63s.) eased further on some nervousness about the coming quarterly report.

The appearance of a jobber's circular recommending the shares of some of the older mines in the light of their break-up values attracted some interest. Estimates of likely capital repayments when compared with current market prices of the shares looked encouraging. Moreover, should there be an increase in the gold price over the next year or two, some of the mines in question would gain a new lease of life. Rand Leases, with its big reserves of ore unpayable in terms of the present gold price, was considered an attractive speculation, and the shares rose to 7s. 1½d. Also better were Modder East (14s. 3d.), Government Areas (4s. 7½d.), and Van Dyk (4s. 7½d.). Elsewhere, West Wits went ex rights to the one-for-ten issue of new shares at 45s. West Wits "olds" were called 52s. 9d. x.r. and the new started at 8s. premium.

### The feature of the diamond section

was the advance of several shillings to 130s. in De Beers. This was the result of some comment to the effect that not only was an increase in the final dividend possible, but also that there might be a scrip issue in view.

The price of copper strengthened to just over £230 a ton, and copper shares in New York were a firm exception to an otherwise undecided Wall Street. In London, however, the share market again failed to make much headway. "Tanks" were depressed by news of the Leopoldville riots; this uprising in the hitherto peaceful Belgian Congo touched off some nervous selling from Brussels which lowered them to 50s. 7½d. at one time. Later, there was a recovery, to 53s. "Rhoango" (83s. 1½d.) were a good market for most of the time and a fair amount of call option buying was seen in Rhodesia-Katanga (17s. 6d.).

Other base metal shares moved rather narrowly. The tin group, for instance, showed little inclination to develop any decided trend. The only feature of any importance here was the fall to 25s in Beralt which reflected disappointment with the halt of the recent improved trend in wolfram.

Lake George in the lead-zinc section eased to 3s. 4½d. following the meeting and its news that negative results had been obtained so far from the efforts to find fresh ore deposits. Consolidated Zinc, on the other hand, recovered to 6s. 3d. from their setback of the previous week. Elsewhere, a revival to 7s. 9d. in St. John d'El Rey was attributed to United States buying.

## LONDON METAL AND ORE PRICES, JAN. 15, 1959

## METAL PRICES

Aluminium, 99.5%, £180 per ton	Iridium, £19/£21 oz. nom.
<b>Antimony</b>	Lanthanum (98/99%) 15s. per gram.
English (99%) delivered, 10 cwt. and over £190 per ton	Manganese Metal (96% - 98%) £290
Crude (70%) £190 per ton	Manganese, 2d. lb.
Ore (60%) bases 19s. 6d./20s. 6d. nom. per unit, c.i.f.	Nickel, 99.5% (home trade) £600 per ton
Arsenic, £400 per ton	Osmium, £16/£17 oz. nom.
Bismuth (min. 1 ton lots) 16s. lb. nom.	Osmiridium, nom.
Cadmium 9s. 6d. lb.	Palladium, £5/£5 1s.
Cerium (99%) net, £16 0s. lb. delivered U.K.	Platinum U.K. and Empire Refined £19 10s oz.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.	Imported £17 10s./£18 0s.
Cobalt, 16s. lb.	Quicksilver, £74 0s. ex-warehouse
Germanium, 99.99%. Ge. kilo lots 2s. 5d. per gram.	Rhodium, £40/£41 oz.
Gold, 24cts. 11d.	Ruthenium, £13/£15 oz. nom.
	Selenium, 50s. Od. per lb.
	Silver, 76d. f. oz. spot and 75d. f.d.
	Tellurium, 15s./16s. lb.

ORES AND OXIDES

<b>Bismuth</b>	• • • • •	• • •	30% 5s. 0d. lb. c.i.f. 20% 3s. 3d. lb. c.i.f.
<b>Chrome Ore—</b>			
Rhodesian Metallurgical (semifriable) 48%	(Ratio 3:1)	• •	£15 15s. 0d. per ton o.f.f.
" Hard Lumpy 45%	(Ratio 3:1)	• •	£15 10s. 0d. per ton o.f.f.
" Refractory 40%	• •	•	£11 0s. 0d. per ton c.i.f.
" Smalls 44%	(Ratio 3:1)	• •	£14 0s. 0d. per ton c.i.f.
Baluchistan 48%	(Ratio 3:1)	• •	£11 15s. 0d. per ton f.o.b. nom.
Columbite, 65% combined oxides, high grade	• •		
Fluorspar—			
Acid Grade, Flotated Material	• • •	•	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF <sub>2</sub> )	• • •	•	156s. 0d. ex. works
Lithium Ore—			
Petalite min. 34% Li <sub>2</sub> O	• • •	•	40s. 0d./45s. 0d. per unit f.o.b. Beira
Lepidolite min. 34% Li <sub>2</sub> O	• • •	•	40s. 0d./45s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li <sub>2</sub> O	• • •	•	25s. 0s. per ton f.o.b. Beira
Magnesite, ground calcined	• •	•	£28 0s./£30 0s. d/d
Magnesite Raw (ground)	• •	•	£21 0s./£23 0s. d/d
Manganese Ore Indian—			
Europe (46% - 48%) basis 5s. 0d. freight	• • •	•	83d./85d. per unit c.i.f. nom.
Manganese Ore (43% - 45%)	• • •	•	70d./75d. per unit c.i.f. nom.
Manganese Ore (38 ½ - 40 ½%)	• • •	•	50d./54d. per unit c.i.f. nom.
Molybdenite (85%) basis	• •	•	8s. 11d. per lb. (f.o.b.)
Titanium Ore—			
Rutile 95/97% TiO <sub>2</sub> (prompt delivery)	• • •	•	£35/£36 per ton c.i.f. Aus'tn.
Ilmenite 52/54% TiO <sub>2</sub>	• • •	•	£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)	• •	•	92s. 6d./97s. 6d. per unit c.i.f.
Vanadium—			
Fused oxide 95% V <sub>2</sub> O <sub>5</sub>	• • •	•	8s. 0s. 11d. per lb. V <sub>2</sub> O <sub>5</sub> c.i.f.
Zircon Sand (Australian) 65 - 66% ZrO <sub>2</sub>	• • •	•	£14 0s. per ton c.i.f.



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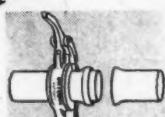
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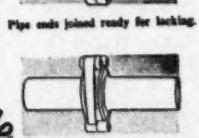
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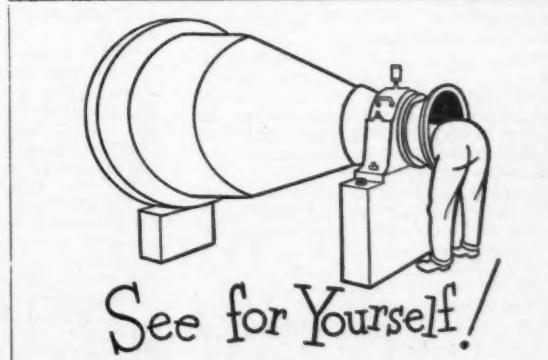
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# ANGLO AMERICAN CORPORATION OF SOUTH AFRICA LIMITED

(Incorporated in the Union of South Africa)

## GOLD MINING COMPANIES IN THE ORANGE FREE STATE

(All companies mentioned are incorporated in the Union of South Africa)

### Extracts from the Statements by Mr. S. SPIRO, Chairman of the Companies

issued with the Annual Reports for the year ended September 30, 1958

#### PRESIDENT BRAND GOLD MINING COMPANY LIMITED

**F**OR the past financial year, the outstanding feature has been the very substantial rise in the total working profit from £5,287,295 in the previous year to £6,585,271.

This improvement in profit was made possible by the milling rate being increased from 71,000 tons in October, 1957, to 98,000 tons in August and September, 1958 and by the introduction of surface waste sorting in February, 1958, which increased from 2 per cent. in that month to 12 per cent. in the last two months of the financial year. The benefit derived from sorting becomes apparent when it is appreciated that, at little cost, it contributed towards the gold recovery grade being maintained at 14.89 dwt per ton—a relatively small decline from the average of 15.21 dwt per ton in the previous year, bearing in mind the larger tonnages of lower grade ore drawn from No. 2 Shaft. The increase in the milling rate more than compensated for this decline in grade, and working profits from production of gold were £6,048,459 compared with £4,807,350 for the previous financial period.

The company continued to participate actively in the joint uranium production scheme and 226,332 lb. of uranium oxide were apportioned to it, representing an average yield of 0.266 lb. per ton. The estimated profit from this source increased by £56,867 to £536,812.

In June, 1958, the capital of the company was increased by the issue, and conversion into units of stock of 1,040,000 new shares of 5s. each at a price of 45s. The net proceeds, totalling £2,276,568, will be used towards financing the expansion programme.

The dividend distribution of 5s. per unit of stock during the 1957 financial year was maintained, with interim and final dividends of 2s. 6d. per unit of stock declared respectively in March and September, 1958. The final dividend was paid on the increased capital.

#### No. 3 Shaft System

In my review last year, proposals were outlined for a joint shaft system to serve the south-eastern section of our lease area on one side of the common boundary with President Steyn, and the south-western section of the President Steyn property on the other. This plan has since been superseded by a scheme involving the sinking of separate No. 3 Shaft systems by each company. This company's new No. 3 Shaft system, sited approximately 5,000 feet to the north-east of No. 1 Shaft, will comprise circular hoisting and ventilation shafts, 24 feet and 20 feet in diameter respectively. Preliminary work on the installation of the collar and hoist foundations and on the erection of the shaft buildings is in

progress, and it is anticipated that the shafts will be completed to their final depth of approximately 5,000 feet and brought into commission during 1961. Pre-cementation is being undertaken in the expectation that the quantity of water likely to be encountered during sinking will be reduced.

It is estimated that the No. 3 Shaft system, together with the necessary extension to the reduction plant and other installations, will cost approximately £4,100,000 and it is planned to finance this expenditure from the proceeds of the share issue, a new loan of £500,000 from the National Finance Corporation and by appropriation from profits of the balance of funds required for the programme.

Capital expenditure during the year totalled £2,088,670; £1,806,775 being spent on shaft sinking and equipment and £64,000 on development charged to capital account. During the current year it is anticipated that approximately £2,000,000 will be expended on capital account.

Profits earned by your company during the year exceeded the total of the assessed loss for tax purposes brought forward from September 30, 1957, and the capital expenditure, ranking for redemption, incurred during the year. Your company consequently became the first of the "new" gold mines, as defined in the Income Tax Act, to become liable for taxation and has set aside £250,000 to meet this commitment. However, the programme to increase the milling rate to 140,000 tons per month should result in an increase in the working profit which it is hoped will be at least sufficient to offset the effect of taxation and lease payments, on profits available for distribution to stockholders. The full benefit of this expansion programme on working profits is expected to occur during the latter half of 1962, but prior to this, I anticipate that profits available for distribution as dividends will remain unaffected by taxation and lease payments due to the gradual increase in working profits, consequent on the increasing milling rate, and the effect of capital expenditure ranking for redemp-

During the current financial year it is hoped to maintain the milling rate at approximately 100,000 tons per month and surface waste sorting at a minimum proportion of ten per cent. We have been aided in this objective by the present unusually favourable supply of non-European labour. This year the usual decline has not yet been evident, and it is hoped that the very small exodus that has recently started will be made up by the fresh labour coming forward in January and February, 1959.

Development in the mine as a whole disclosed an average gold content of 1,103 inch-dwt. compared with 1,081 inch-dwt. during the 1957 financial year. At No. 1 Shaft development on reef was mainly to the north of the shaft on 46, 44 and 42 Levels where satisfactory values were disclosed, whilst south of the shaft work was confined to making connections between established levels. The average payable values at No. 1 Shaft increased from 1,520 inch-dwt. to 1,614 inch-dwt. Values from No. 2 Shaft were equal to those expected at 557 inch-dwt. compared with 674 inch-dwt. in the previous year. At this shaft development took place on all levels from 46 Level to 42 Level and on the newly-established 50 Level and 48 Level served by the sub-incline shaft system.

Ore reserves were increased from 3,043,000 tons at September 30, 1957, to 3,588,000 tons at the end of the year under review. Grade improved fractionally to 17.73 dwt. per ton and the stoping width rose by 1.42 inches to 51.78 inches. Over the same period uranium values decreased from 17.475 inch-lb. to 16.931 inch-lb.

The large proportion of development off reef was mainly as a result of the extensive footage driven in the haulage from No. 1 Shaft on 46 Level towards the Welkom No. 3 joint ventilation shaft. This haulage has now crossed the boundary into the Welkom property, and it is anticipated that the hoing with the joint ventilation shaft will be effected towards the end of December, 1958. When this occurs, it will be possible to concentrate on advancing the twin crosscuts presently being driven on 46 Level eastwards towards the area of the new No. 3 Shaft system. Development will be undertaken in this area to provide the necessary connections for ore transport to coincide with the projected commissioning of the shaft system in 1961.

As a result of the proximity of the shale in the hanging wall, it has been found that certain raise connections, which are not required for immediate stoping operations, tend to collapse. A considerable amount of redevelopment has subsequently to be undertaken to open up these raises when eventually required for stoping. It has therefore been decided to keep the number of new raise connections at the minimum and so reduce this unnecessary redevelopment. The effect of this policy will be to reduce the total reef footage sampled during the current year.

In September, 1958, 13 months after the commencement of sinking operations, the No. 2D ventilation shaft was completed to its final depth of 4,407 feet. The speed at which this shaft has been sunk is greatly to the credit of the min-

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management and the sinking crews. Precementation reduced the quantity of water encountered and the use of improved techniques contributed to the efficiency of sinking operations. The main fans are at present being installed and will be commissioned early in 1959. The increased ventilation capacity will improve working conditions and make possible further exploitation in the No. 2 Shaft area.

#### Encouraging Borehole Values

In September, 1958, surface Borehole SP 6, sited approximately 2,650 feet east of No. 2 Shaft, being drilled for geological information in connection with the depth of the reef adjacent to the Arrarat fault system, intersected Basal Reef at a depth of 7,242 feet. The core recovery was incomplete and assayed 29.94 dwt over a width of 36 inches, equivalent to 1,078 inch-dwt. Uranium values over the 36 inches were 0.407 lb., equivalent to 14.652 inch-lb. A deflection, in which a complete exposure was obtained, disclosed a gold content of 173.15 dwt over 19.5 inches equivalent to 3,376 inch-dwt. Uranium values

averaged 2.074 lb. equivalent to 40.443 inch-lb.

The area, in which Borehole SP.6 was sunk, had not previously been explored and its potential value has been estimated on the basis of information disclosed by Boreholes SP.5, SP.4 and SP.1, together with values revealed in development on the 46 and 44 Levels north-east of No. 2 Shaft. The considerably higher values disclosed in SP.6 encourage hopes that the zone of high values encountered at No. 1 Shaft may extend further to the south-east than was originally anticipated, and that this locality of the mine may prove to be of higher value than previously estimated. Originally it was thought that the reef in this area had been thrown up from the 70 Level horizon to an elevation above the 6,000 foot horizon by a branch fault of the Arrarat fault system. Borehole SP.6 did not confirm the presence of the suspected faulting and it has therefore been decided to sink the 2B sub-vertical shaft system to a depth that will allow a bottom station on 72 Level, corresponding with the depth of the reef in the borehole. It is

anticipated that this sub-vertical shaft system will be commissioned early in 1959; thereafter, levels below the 48 and 50 Levels, which have been established and developed from the sub-incline shafts, will be opened up from the sub-vertical shafts.

Early in the year negotiations between representatives of the Combined Development Agency and the Atomic Energy Board were concluded, resulting in a sales quota of 3,100 short tons of uranium oxide being granted to the industry for the period July 1 to December 31, 1958. Thereafter the agreed annual quota will be 6,200 short tons, subject to periodical reduction after 1963, until the expiry of all current contracts with South African uranium producers. The joint uranium scheme's contract for sales of uranium oxide will cease on December 31, 1965. The quota allocated to the joint production scheme for the six months ending December 31, 1958, was 290.605 short tons. Subject to certain industry adjustments, subsequent annual quotas are expected to be of the minimum order of 581 short tons.

## FREE STATE GEDULD MINES LIMITED

**R**EPORTS published during the 1958 financial year have already given an indication of the satisfactory progress achieved by your company. In the current year, I confidently expect that the improving trend will be maintained, with further increases in milling rate, in the recovery grade and consequently in profits. Exploratory work has revealed additional areas of promise which, when more fully developed, should add substantially to the ore reserves and increase the estimated grade of the ore blocked out at No. 1 Shaft.

The substantial rise in the working profits from £2,254,060 to £4,049,001, was the result of the increase of 2.57 dwt per ton in the recovery grade which averaged 14.34 dwt per ton for the year, and the steady improvement in the milling rate from 63,500 tons in October, 1957, to 74,000 tons in September, 1958.

The higher profits made it possible for the company to follow its maiden dividend of 1s. per share declared in September, 1957, with an interim dividend of 2s. per share in March and a final dividend of 3s. per share in September, 1958, making a total distribution for the year of 5s. per share. Simultaneously with the declaration of dividends, amounts totalling £1,060,062 were appropriated from profits for repayment of the outstanding balance of the £1,500,000 loan advanced by the parties to the company's flotation agreement. The appropriations for dividend and for repayment of the loan and other small appropriations left a balance of profits for the year of £343,625, which has been carried forward.

At September 30, 1958, the assessed loss for purposes of taxation was £13,725,000. During the year £758,485 was expended on fixed assets, of which £115,000 was the cost of excess development charged to capital account. It is anticipated that capital expenditure during the current year will absorb approximately £600,000, and that no excess development will be charged to this account.

In my review last year, I dealt in some detail with the proposed issue of the company's 1,201,246 reserve shares. Members might recall that the Anglo

American Corporation had undertaken to subscribe for 497,346 shares in the company at a price of 80s. per share—a right exercisable by the Corporation on December 31, 1957, in consideration of the loan facilities of £5,000,000 granted by it to the company until December 31, 1960. At the same time members were given the right to subscribe for the remaining 703,900 reserve shares in the company at the same price of 80s. per share. The proceeds from the exercise of these rights totalling £4,804,984, were applied in reduction of the loan facilities.

#### Development Results

It is pleasing to record at the outset that the average of development values for the mine, at 1,365 inch-dwt, was slightly in excess of the previous year's average of 1,338 inch-dwt. In all, 90,180 feet were driven during the year in exploratory development and in building up ore reserves. As a result of this development, the estimated ore reserves rose from 1,899,000 to 2,435,000 tons; grade improved by 1.06 dwt to 19.8 dwt per ton and the estimated stoping width decreased by 0.91 inch to 46.04 inches.

At No. 1 Shaft the average development values were 745 inch-dwt compared with 823 inch-dwt in the previous financial year. Development on reef continued in the area north-east of the shaft on the 53 to 47 Levels, where the reef is readily accessible owing to comparative freedom from faulting. The grade of the reef exposed in this area was, however, lower than the average values encountered in the remainder of the mine.

South-west of No. 1 Shaft a clearer picture of the geological structure of this section of the mine has been revealed by development on the 49 and 47 Levels and by underground diamond drilling. Between 51 and 47 Levels the normal dip of the reef from west to east flattens to the horizontal and subsequently dips from east to west, forming a dome. Access to the reef on the lower horizons in this area will be gained from development on 50 Level, which in turn has been established from an incline haulage raised from 51 Level.

Further south, reverse faulting has re-

sulted in the reef lying above the 4,500 feet horizon and a haulage is being driven towards this locality from 45 Level South to explore the area. A further haulage will be driven towards this area from a new station now being established on 43 Level. Development values so far disclosed by a limited amount of development on reef from 49 Level in this south-western area have been most satisfactory, and it is expected that, during the coming year, it will be possible to increase the footage driven on reef when the haulages at present being developed on 50, 45 and 43 Levels reach the position of the reef.

At No. 2 Shaft, a substantial footage of reef with high values was exposed by development on all levels from 51 to 41 Levels being driven towards the boundary with Western Holdings. Although numerous dykes have been encountered, a satisfactory feature of this area has been the relative freedom from major faulting. The larger proportion of the mine's development on reef was concentrated in this area to provide sufficient working faces and reserves to achieve a better balance in mining operations between the two shafts. The average values from development at No. 2 Shaft were identical to those disclosed in the previous year at 1,720 inch-dwt.

#### No. 1 Borehole Area

In my review last year, I explained the reasons why immediate development of the area surrounding the Geduld No. 1 Borehole was not practicable. Development towards the borehole would serve no useful purpose in providing stope tonnage, until haulages have been established on 41 and 49 Levels to provide access to, and ventilation for, the area. During the year, 41 Level was established by incline raises from 43 Level, and will be developed towards the borehole in the current year. Development has also started from a station cut on the 39 Level at No. 2 Shaft and crosscuts are being driven in a westerly direction. Progress is being hampered while these crosscuts are traversing an extension of the zone of faulting and water-bearing fissures encountered when lower

levels were being advanced, but it is hoped that development through this difficult ground will have been completed early in 1959. Thereafter the haulage will be driven in a south-westerly direction towards the area of the Geduld No. 1 Borehole. In view of the footage still to be driven, it will be appreciated that some time may elapse before development reaches the immediate vicinity of the borehole and before stope connections can be made.

Work has started on a scheme to reclaim the shaft bottom at No. 2 Shaft, which was sealed off by a concrete plug above 53 Level when an inrush of water flooded the shaft in 1953. Completion of the reclamation work will enable further areas to the north and south of the shaft to be opened up by development from the 53 Level station, and will enable No. 2 Shaft loading arrangements to be re-established in the original position.

The shaft collar and construction work, preparatory to sinking the 18-foot diameter ventilation shaft west of No. 2 Shaft, was completed in April, 1958, and in May, shaft-sinking crews took over from the contractors at a depth of 222 feet below the collar. In June, the first full month of sinking operations, the shaft was deepened 606 feet, a record for shaft-sinking on mines of the Anglo

American Corporation Group in the Orange Free State. It is expected that the shaft will be completed to its final depth of 4,825 feet towards the end of June, 1959.

The grade of uranium oxide so far disclosed in development does not indicate that a profit can be derived from its treatment. However, the company remains a participant, with other companies, in the joint production scheme entitling it to certain treatment facilities at the plants of the Welkom and President Steyn Mines, should the grade of uranium in the residue slimes become economic.

In the South African gold mining industry a decline in the supply of non-European labour normally occurs in the second half of each calendar year, and assumes maximum proportions in October to December. This seasonal decline has not yet been evident this year because of a number of unusual circumstances. The effect of this will be to the advantage of your company and it is anticipated that milling rates in excess of those planned for the first quarter of the current financial year should be attained.

With the technical collaboration of the Council for Scientific and Industrial Research, construction of the first large-scale water demineralization plant in the

world proceeded apace on your company's property. The plant is designed to treat three million gallons of saline water per day to produce approximately 2,400,000 gallons of fresh water suitable for use in industry and agriculture. Testing started in November, 1958, and it is hoped that the plant will be fully commissioned shortly, treating underground water from the company's mine as well as from Welkom Mine and Western Holdings. The fresh water produced will be sufficient to supply the full requirements of the Welkom Mine uranium plant and, in addition, a proportion of the water required by your company and by Western Holdings.

Whilst the technical success of the plant appears to be assured, it has yet to be proved whether the fresh water can be produced at a price competitive with water supplied by the Department of Water Affairs. Your company has the right, should it so decide, to take over the plant by compensating the other contributors for their proportionate share of the cost. In view of the considerable problem faced by the mining companies of the Orange Free State, in disposing of saline water pumped from underground, the possibility of being able to put this water to use is naturally of great importance.

## WELKOM GOLD MINING COMPANY LIMITED

**I**N reviewing your company's activities during the past year, I would draw attention to the steady upward trend that has continued in all spheres of operations. Further development and expansion into hitherto unexplored areas of the mine is providing a sound foundation for the future prosperity of your company. Whilst sounding this optimistic note, I would remind members that portions of profits, equivalent to dividends declared, have still to be allocated over the next few years towards redemption of the balance of the company's unsecured registered debentures, amounting to £1,002,315 at September 30, 1958. In addition, arrangements will have to be made regarding the temporary loan facilities of £2,500,000 that fall due for repayment to the Anglo American Corporation on December 30, 1959.

The working profit from the production of gold increased by approximately a third, from £641,721 to £870,341, primarily as a result of a rise of 0.72 dwt. per ton in the average recovery grade, which was 5.95 dwt. per ton for the year under review.

Profits from uranium oxide production, estimated at £668,778, made a substantial contribution to the company's total working profit of £1,539,119 for the year. The profit of £317,844 earned from this source in the previous year was based on residue slimes which were contributed to the joint production scheme only in the last five months of that year.

In view of the large proportion of profits arising from the production of uranium oxide, I feel that members will be interested in the arrangements that have been made regarding future sales. Early in 1958, representatives of the Combined Development Agency and the Atomic Energy Board met, and as a result of negotiations, South African uranium producers were granted a sales quota of 3,100 short tons of uranium oxide for the period July 1 to December 31, 1958.

As a matter of interest, this compares with 3,048,270 short tons of uranium oxide produced and sold to the Agency in the first half of 1958. In subsequent years, up to 1963, the Industry's sales quota will be 6,200 short tons per annum; thereafter, the quota will be adjusted as individual producers' contracts for the supply of uranium oxide expire.

The joint production scheme's quota for the six months to December 31, 1958, is 290,605 short tons and, subject to certain industry adjustments, future quotas are likely to be, at the minimum, 581 short tons per annum until expiry of the contract in December, 1965.

Dividends of 3d. per share were declared in March and September, 1958, making a total distribution of 6d. per share for the year as compared with 3d. per share declared in September, 1957. An amount of £306,250, equivalent to the dividends declared, was appropriated towards the redemption of the company's 5 per cent unsecured registered debentures in terms of their conditions of issue.

At September 30, 1958, your company's estimated assessed loss for purposes of taxation was £15,444,000. Expenditure during the year on fixed assets amounted to £1,107,197, including a contribution of £92,664 towards the amortization of the uranium project on the President Steyn property. Contributions received from participants in the joint uranium production scheme towards the amortization of this company's uranium plant totalled £330,919. It is anticipated that in the current financial year approximately £800,000 will be expended on capital account.

### Improved Ore Reserve

During the year, the ore reserve position improved generally; estimated reserves increased from 3,471,000 tons at the end of the previous financial year to

3,632,000 tons at September 30, 1958; the grade was 0.58 dwt. higher at 7.10 dwt. per ton, and the stoping width decreased by 1.15 inches to 45.16 inches; uranium values rose from 14.585 to 15.298 inch lb. in the same period.

In the area served by No. 1 Shaft, development values averaged 313 inch dwt.; development being undertaken mainly in the area north of the shaft on all levels from 35 Level to 30 Level. In 35 Haulage North, a large fault was encountered, and the haulage is now being driven in an easterly direction to locate the reef, estimated to have been displaced laterally approximately 1,000 feet. It is anticipated that the position of this fault will be more clearly delineated when it is intersected on the 32 and 30 Level Haulages. Thereafter, crosscuts on these levels will be driven in an easterly direction to renew contact with the reef.

Development at No. 2 Shaft was mainly confined to the area south-east of the shaft on the 35, 32, 30 and 27 Levels. It will be recalled that the presence of a sill, splitting the Basal Reef by an intrusion on 35 and 32 Levels, was revealed by development earlier in the year. Development further south on 35 Level has disclosed that the sill passes into the footwall, and Basal Reef values sampled beyond the area of the sill have proved satisfactory.

Towards the end of the financial year, development was recommenced on the 27, 25 and 22 Levels south-west of No. 2 Shaft in the general direction of No. 3 Shaft. Although the footage sampled in this area has been limited, the gold content has been encouraging. Development values have also been satisfactory north of No. 2 Shaft on 35 and 32 Levels, where faulting caused a considerable degree of dislocation. The average of development values for the year at No. 2 Shaft was 339 inch dwt.

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started. The final depth of 1,726 feet was reached during September, and a holing has been effected with workings on 18 Level. The fans at the winze were commissioned in November, and the resultant improvement in the ventilation of the upper levels of the area west of No. 1 Shaft will make possible the exploitation of further working faces in this area. The improvement in ventilation in the area south-west of No. 2 Shaft, consequent on the holing during the year with No. 3 Joint Ventilation Shaft on 22 Level, may obviate having to sink a further ventilation winze to the sub-outer of the reef west of No. 2 Shaft, a possibility mentioned in my review last year.

I have emphasized the importance to your company of the rise in the gold recovery grade by 0.72 dwt. per ton. This was achieved by increasing surface waste sorting from 0.9 per cent to an average of 7.17 per cent. In addition, the total of 1,026,500 tons milled was slightly higher than the 1,024,000 tons milled in the previous year. A plan to increase the milling rate, whilst maintaining surface

waste sorting at approximately 12 per cent, is being actively pursued, and involves the opening up of further areas. To the east this will be accomplished by deepening both No. 1 and No. 2 Shafts, and to the west by development from the new No. 3 Shaft system.

The No. 3 Hoisting Shaft was completed in February, 1958, to its final depth of 4,490 feet, and the shaft was commissioned as a hoisting unit in June. Cutting of the main stations, pump chambers, and ore passes having been completed, development has commenced on the 42, 40 and 37 Levels. A certain amount of development on reef will be undertaken during the current financial year, and it is anticipated that a limited amount of stope tonnage will become available from this shaft towards the end of 1959. The main fans are being installed at the No. 3 Joint Ventilation Shaft and will be commissioned early in 1959.

The deepening of No. 1 Shaft was continued during the year, and work is now

in progress cutting the loading station below the bottom station at 45 Level. It is anticipated that the shaft will be commissioned to its final depth during 1959, thus making possible development on the lower levels to the east of the shaft. Deepening of the No. 2 Shaft was started in the last quarter of the year under review, and it is expected that the shaft will be commissioned to its final depth of 4,650 feet towards the end of 1959.

Expansion of your company's mining activities depends, to a very large degree, on an adequate supply of non-European labour. The decline in the supply of non-European labour, which normally commences midway through the calendar year and assumes maximum proportions in October to December, has not yet been evident, and it is therefore hoped that the influx of labour, which is expected to occur early in 1959, will provide the mine with an adequate labour force to undertake its stoping and development programme.

## PRESIDENT STEYN GOLD MINING COMPANY LIMITED

DURING the year under review, there was a considerable increase in the tonnage of ore sent to the reduction plant. In all, 1,144,000 tons were milled, which is 46,000 tons more than in the preceding year, and, although not fully maintained in August and September, a milling rate of 100,000 tons was achieved in July, 1958. In addition, surface waste sorting was appreciably increased from 3.77 per cent to 11.91 per cent. Notwithstanding the larger tonnage milled at an average grade of 7.64 dwt. per ton, which is approximately the same as in the previous year, a slight rise in working costs reduced our gold profits from £2,408,411 to £2,360,532.

Other participants in the joint uranium production scheme contributed practically their full tonnage entitlement for the year, with the result that less slimes from your company's property were treated than in the previous year, and our estimated profits from this source declined from £744,200 in 1957 to £740,090.

The issued capital of your company was increased to £3,500,000 in June, 1958, when 1,000,000 reserve shares of 5s. each were issued at a price of 24s. per share. The net proceeds of the issue, amounting to £1,166,857, will be used towards financing the expansion programme referred to later in this review.

Dividends paid in respect of the year totalled 2s. 6d. as compared with 2s. 9d. in 1957, and 1s. 9d. in 1956. In view of the projected capital expenditure programme, it was considered prudent to conserve the resources of your company, and the final dividend paid on the increased capital was accordingly limited to 1s. 3d. per share.

At September 30, 1958, the assessed loss for tax purposes, still to be agreed with the Receiver of Revenue, was £9,047,000. Capital expenditure during the year amounted to £439,011, including £94,980 contributed to the uranium plant on the property of Welkom Gold Mining Company, Limited. The amount received from participants in the joint uranium production scheme towards amortization of the uranium plant at your company's mine was £324,250. It is anticipated that capital expenditure in the current year will be approximately £1,000,000.

In my previous review, proposals were outlined for opening up the south-western portion of our lease area. It was then planned to do so by joining with the President Brand company in sinking a joint shaft system. Members were, however, subsequently informed by circular that, after detailed consideration of the technical and financial requirements of the company, and in particular the desirability of achieving a substantially increased milling rate at the earliest possible opportunity, it was decided that the company should instead sink its own shaft system. Agreement in principle was also reached with the President Brand company to re-align the common boundary between the two properties to coincide as far as possible with the natural geological boundary formed by the Arrarat fault system. This exchange of ground will be subject to the approval of the State, but will clearly be to the advantage of both companies, and is only being delayed until more information regarding the position of the fault system is available.

### New No. 3 Shaft System

The new No. 3 Shaft system will consist of a circular hoisting shaft 26 feet in diameter and a 20-foot diameter ventilation shaft sunk to an approximate depth of 6,200 feet. Construction of the shaft collar and the foundations of the headgear and winding plant will be started early in 1959. A start has already been made with a pre-cementation programme which, it is anticipated, will reduce the quantity of water likely to be encountered in the course of sinking operations. The new shaft system is expected to be commissioned during 1962 and will make it possible to increase the mine's milling rate to 140,000 tons per month. It is estimated that the shaft, together with the necessary extensions to the reduction plant and other installations, will cost approximately £4,750,000. This expenditure will be financed partly from the proceeds of the share issue referred to earlier in this review, partly by a new loan of £500,000 from the National Finance Corporation, and the balance by appropriation from profits.

The ore reserves at September 30,

1958, were estimated at 4,344,000 tons, averaging 8.34 dwt. per ton over a stope width of 44.67 inches—an increase, as compared with the previous year, of 417,000 tons, a decrease of 0.47 dwt. in grade and a rise of 0.42 inch in the stope width.

In No. 1 Shaft area, development continued north-west on the 42, 40 and 32 Levels and south-west on all levels from 40 Level to 32 Level. The crosscut on 27 Level being driven from No. 1 Shaft towards the joint ventilation shaft on the Welkom property, intersected a badly fractured water-bearing zone, associated with the Arrarat fault system, and its progress was considerably hampered. Further delays in this crosscut must be expected until this fault system has been traversed. During the current year a small sub-incline shaft will be sunk in the vicinity of No. 1 Shaft to enable exploratory work to be undertaken at depths below the 42 Level horizon.

At No. 2 Shaft, further development footage was driven to the north-east of the shaft on the 48, 46 and 44 Levels, and to the south-west, on the same levels, in the direction of the new No. 3 Shaft system. Since the end of the financial year, development to the south-west of the shaft has disclosed promising values.

In September, 1958, surface borehole SP.6, sunk by the President Brand company approximately 2,650 feet east of its No. 2 Shaft to provide information on the geological structure in the vicinity of the Arrarat fault system, intersected the Basal Reef at a depth of 7,242 feet. Core recovery was incomplete and values of gold and uranium averaged 1,078 inch dwt. and 14.652 inch lb. respectively. In October, a deflection, in which a complete core recovery was obtained, disclosed values of 3,376 inch dwt. and 40.443 inch lb. Whilst it is not possible at this stage to determine what significance these high values may bear in relation to your company's lease area, it is hoped that the zone of high values encountered at the President Brand No. 1 Shaft may extend further to the south-east than originally anticipated.

The year was notable in that the gold mining industry did not experience the

decline in the supply of non-European labour which, in previous years, started in June and assumed maximum proportions in the October-December quarter. A small efflux has recently started, but it is hoped that this will be offset by the seasonal influx which usually starts early in the calendar year.

In April, 1958, representatives of the Combined Development Agency visited

the Union for discussion with the Atomic Energy Board regarding future sales of uranium oxide. In terms of the agreement concluded, the Agency will purchase 3,100 short tons of uranium oxide from South African producers during the period July 1 to December 31, 1958. Thereafter, the quota will be 6,200 short tons per annum, subject to this quantity being reduced after 1963 as and when

current contracts with individual producers expire. The quota allocated to the joint production scheme for the six months ending December 31, 1958, is 290,605 short tons. Subject to certain adjustments within the Industry, the scheme's subsequent annual quotas are expected to be of the minimum order of 581 short tons until December, 1965, when our contract terminates.

## WESTERN HOLDINGS LIMITED

**T**HE most notable improvement in the results of your company's mining operations was the increase in the average gold recovery grade from 9.41 dwt per ton to 10.86 dwt per ton. The higher recovery grade together with an increase from 1,144,000 to 1,169,000 in the tons milled resulted in the working profit for the year rising to £4,708,288 as compared with £3,726,924 for the year ended September, 1957. Dividends of 3s. and 4s. per share were declared in March and September, 1958, a total distribution of 7s. as compared with 5s. per share for the previous year.

The estimated assessed loss for tax purposes at September 30, 1958, was £3,620,000. Expenditure on fixed assets totalled £1,555,354 and it is anticipated that capital expenditure will be approximately £1,000,000 in the current year.

### Higher Milling Rate

During the current financial year I anticipate that an even larger tonnage of ore will be milled at a slightly higher average grade of gold recovery. The seasonal exodus of non-European labour to the Reserves has not yet been evident, and a milling rate of 100,000 tons per month has been maintained since June, 1958. It is hoped that the influx of fresh labour usually occurring in the early months of each calendar year, will make it possible to increase the milling rate beyond 100,000 tons per month in the second quarter of our financial year. In addition, work has started on the expansion of the reduction works to a capacity of 150,000 tons per month, and after its completion in March or April, 1959, further gradual increases in the milling rate are planned—the additional tonnages being drawn, initially from the present workings served by No. 1 and No. 2 Shafts.

Towards the end of 1959 it is anticipated that limited stope tonnages will become available from No. 3 Shaft, and thereafter the monthly milling rate should increase commensurately with the gradual build up of operations in the area served by this shaft.

The improvement in the payable values, disclosed in development at both No. 1 and No. 2 Shafts resulted in a rise in the value of the ore reserves from 13.99 to 15.03 dwt per ton. At the year end, the estimated ore reserves were 4,330,000 tons compared with 3,930,000 in the previous year; the stoping width increasing by 1.19 inches to 46.93 inches.

At No. 1 Shaft development was mainly in the area to the north and north-west of the shaft towards the Free State Geduld boundary on 43, 41, 38 and 36 Levels. The 38 and 36 Level haulages were driven further in the direction of the Geduld No. 1 Borehole, but a considerable footage still remains to be developed before reaching the vicinity of the borehole. Payable values disclosed in the area served by No. 1 Shaft rose from 991 inch-dwt to 1,046 inch-dwt in the year.

In the areas served by No. 2 Shaft payable values averaged 1,351 inch-dwt compared with 1,552 inch-dwt in the previous year, and development south of the shaft on all levels from 43 to 36 Levels continued to reveal encouraging values. Midway between Nos. 1 and 2 Shafts a raise from 33 Level in the direction of No. 3 Shaft disclosed values tending to confirm those revealed by sampling of the reef intersected in the No. 3 hoisting shaft. It will be recalled that the basal reef was intersected in this shaft at a depth of 2,945 to 2,958 feet with average values from 18 sections assaying 262.38 dwt over 12.44 inches equivalent to 3,264 inch-dwt.

Information made available by the two

twin crosscuts being driven east of No. 1 and No. 2 Shafts has been invaluable in planning the general layout of the eastern portion of the mine. Exploitation of the reef lying below the 43 Level horizon is to be carried out from sub-inclines from both these shafts. At No. 1 Shaft work preparatory to sinking is in hand, and at No. 2 Shaft sinking of the sub-inclines has commenced. Haulages from the No. 1 Shaft on the 41 and 38 Levels are being driven east to intersect the reef beyond the Dagbreek fault, estimated to lie approximately 4,000 feet east of the shaft and to have an upthrust in this area of some 2,500 feet.

The No. 3 Shaft system was completed to its final depth of 3,864 feet in February and was commissioned for hoisting in June, 1958. Development of pump stations, ore passes and loading stations in the shaft area has been practically completed and crosscutting to the reef horizon has started on the various levels. During the current financial year there will be a certain amount of development on reef and stope tonnages are expected to be drawn from the shaft towards the end of 1959. The existing workings served by Nos. 1 and 2 Shafts were connected with the No. 3 Shaft system by a hoisting on the 36 Level south-west of No. 1 Shaft and the additional ventilation capacity available has resulted in a general improvement in underground conditions.

The grade of uranium oxide disclosed in development to date does not indicate that a profit can be derived from its treatment. Nevertheless, the company remains a participant with other companies in a joint uranium production scheme entitling it to certain treatment facilities at the plants of Welkom and President Steyn mines should the grade of uranium oxide in the residue slimes become economic.

Copies of the Reports and Accounts of all the above-mentioned companies may be obtained from the London Secretaries of the Companies — Anglo American Corporation of South Africa Limited, 40 Holborn Viaduct, E.C.1.

### News and Results—Continued

**Anglo Takes Up Ofsit Option.**—Although on December 31, the option date, Ofsit shares stood at no more than the option price of 80s., Anglo American and De Beers exercised in full their right to take up 625,000 ordinary shares. Ofsit's capital is now £5,471,703 in 10s. shares, and the only prior charge is £2,023,183 of bonds raised in Switzerland and redeemable between 1960 and 1966.

**West Wits Offer Terms.**—The terms of West Wits rights offer are one new share at 45s. for every ten shares held. Thus the value of the rights, at the current price for West Wits of about 54s., is about 9d.

The new issue will require 821,171 shares for its satisfaction, so that the total

new cash to be raised will be in the region of £1,840,000, rather more than the £1,700,000 which the company had originally intimated would be the sum needed. The proceeds of the issue are to be used in taking up West Wits entitlement of Western Deep shares, in restoring the company's working capital to £500,000, and in subscribing, when necessary, for West Wits entitlement in any forthcoming issue by F.S. Saaiplaas.

**Tin Control : Another Closure.**—Having filled the quota of sales and stocks for 1958, the dredge of Kramat Tin has been closed down until further notice. The permitted stock of 208 tons will be disposed of against the 1959 export quota.

**MINING ENGINEERS** required to fill positions as Mine Captains in a large Gold Mine in Ghana. Applicants should have a recognized degree in Mining with a minimum of five years' subsequent experience, preferably in Metalliferous Mining. Salary £110/£125 per month, according to experience and qualifications, with bonus added. Continuous contract. Tours abroad twelve months, followed by three months' leave on full pay. Passages paid. Quarters free. Marriage Allowance. Staff Assurance Scheme. Write, stating age and experience, to Box 632, *The Mining Journal*, 15 Wilson Street, Moorgate, London, E.C.2.

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## JOHN SUMMERS & SONS

### ELEVEN YEARS OF PROGRESS

The annual general meeting of John Summers and Sons Ltd. will be held on February 5 in London.

The following are extracts from the circulated statement of the Chairman, Mr. Richard F. Summers :

A table published with the accounts shows the expansion that has taken place in production over the last eleven years. These comparisons show the very considerable growth that has taken place. Coke production has increased more than three times, pig-iron nearly four times, and the output of steel ingots has been doubled. At the same time, the fixed assets have increased by £50,000,000, and the trading surplus by approximately £10,000,000.

A further point which is borne out by the figures is the very substantial amount that we have retained out of the surpluses; had it not been for this policy, the position of the company today would not have been nearly so favourable.

### Strong Competitive Position

I hope you will agree with me that so far in our expansion and dividend policies we have struck the happy medium. When we have completed the present scheme—which we anticipate will be towards the end of 1959, or at any rate in 1960—the company will be in a strong and highly competitive position.

We are financing our present scheme partly from the issue of Ordinary Shares which we made in May, 1957, partly by Bank borrowings, and to a very considerable extent out of our own resources.

I do not think that in the current financial year we can expect to see the same rate of progress as has taken place over the last three or four years, but in the absence of any unforeseen circumstances I would expect the upward trend to start again in the latter part of the financial year 1959-60, with a further substantial improvement in the year 1960-61.

Currently in the home market the demand for sheets remains brisk, and present indications are that at any rate for the next few months this state of affairs is likely to continue. In contrast, however, conditions in the export market are not so favourable; competition from Continental makers is now very keen, and there has been a substantial drop in prices.

Our views on nationalization are just the same as they have been. We are still firmly convinced that the industry under the present organization can serve the Nation better than it could as a State monopoly, and we who are responsible for the conduct of this business feel that it is our duty to take all the steps that we are legitimately entitled to take to try to convince people that the best interests of the Nation are served by leaving the Steel Industry as it is, operated under private enterprise, controlled by people who have spent the whole of their lives in steel, who have built up an unrivalled reputation for labour relations and good management, and have proved that they are fully aware of their duties to their customers and to the economic well-being of the Nation.

## ASHANTI GOLDFIELDS CORPORATION LIMITED

NOTICE IS HEREBY GIVEN that the Board of Directors have today recommended a Final Dividend (No. 124) on the present Issued Capital of the Corporation at the rate of 1s. 0d. per share, plus a Cash Bonus of 6d. per Share from former tax over-provisions, making a total amount of 1s. 6d. per Share, less Income Tax at 8s. 6d. in the £. This Dividend and Bonus, which is in respect of the year ended September 30, 1958, is to be payable on and after April 2, 1959, to all Shareholders on the Registers on February 6, 1959.

The TRANSFER BOOKS WILL BE CLOSED from February 7, 1959, to February 15, 1959, both dates inclusive, for the preparation of Dividend Lists.

By Order of the Board,  
H. HARRIS, Acting Secretary.

Registered Address:  
10 Old Jewry, London, E.C.2.  
January 8, 1959.

## BIBIANI (1927) LIMITED

NOTICE IS HEREBY GIVEN that the Board of Directors have today recommended a Final Dividend (No. 40) on the Issued Capital of the Company at the rate of 2.4d. per Share, less Income Tax at 8s. 6d. in the £. This Dividend, which is in respect of the year ended September 30, 1958, is to be payable on and after April 2, 1959, to all Shareholders on the Registers on February 6, 1959.

The TRANSFER BOOKS WILL BE CLOSED from February 7 to February 15, 1959, both dates inclusive, for the preparation of Dividend Lists.

By Order of the Board,  
H. HARRIS, Acting Secretary.

Registered Address:  
10 Old Jewry, London, E.C.2.  
January 8, 1959.

## BURMA MINES LIMITED

reports that the operations of  
**BURMA CORPORATION (1951) LIMITED**

for the Quarter ended September 30, 1958, resulted in an estimated Net Profit of K.1,66,500 (£12,487) compared with K.9,27,100 (£69,533) in the previous Quarter. The reduced Profit resulted mainly from lower prices realized on a smaller volume of sales. The value of stocks was also adversely affected by lower prices ruling on September 30 compared with the June Quarter.

Details of Revenue, Expenditure, Ore Extraction and Production may be obtained from Central Registration Limited, 9 Basinghall Street, London, E.C.2, upon application.

January 15, 1959.

## JOS TIN AREA (NIGERIA) LIMITED

### PROPOSED STRUCTURAL CHANGES

### NEW CHAPTER IN COMPANY'S HISTORY

The 48th ordinary general meeting of Jos Tin Area (Nigeria) Limited was held on January 14 in London, Mr. A. B. D. Fox, A.R.C.S. (the Chairman), presiding.

The following is an extract from his circulated statement:

The Company has progressed and prospered, having adapted its set-up and methods to suit the conditions and problems with which the Management were faced. Now the board consider that the time has come to open another chapter. Of late years the business of investing and drawing income from the reserves, which it was considered prudent to hold, has assumed increasing importance. The point has been reached at which a return of 10 per cent on the doubled capital can be envisaged—and this out of investment income. In order to insulate the yearly profits from the fluctuations inherent in mining, it is proposed to turn the parent into an investment holding company. In that case "Tin" and "Nigeria" would no longer seem appropriate, so it is suggested that the Company should be renamed Jos Holdings Limited. At the same time, our subsidiary company, dormant during recent years, is to be revived as "Jos Tin Areas Ltd." It will take over the leases and, we hope, it will sustain for many years the success and the goodwill which have in the past attended our Company.

### Operations and Prospects

Up to December, 1957, outputs were substantially above those of the previous year owing to the satisfactory production from our recently acquired properties at Dawa. Then restriction came into force and desperate measures had to be taken in an attempt to limit the fall in market price of Tin. It would be tempting providence to say that we are out of the wood yet, but there are signs of the revival that must inevitably come about.

As to the current year, there has been a welcome improvement in Stock Markets, and investment income should be maintained. With regard to mining operations, there is a tendency sometimes to overcaution in forecasting the future, so that in the event the outcome exceeds expectations. With severe curtailment and the present restriction of over 50 per cent, it is a struggle to "break even", but a small profit may be anticipated.

The report and accounts were adopted.

### METALLURGICAL ENGINEER

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